ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXX. No. 3357. MARCH 27, 1942 6d. WEEKLY

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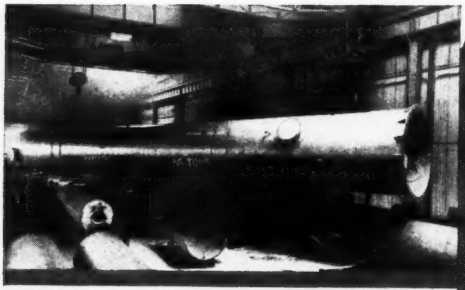

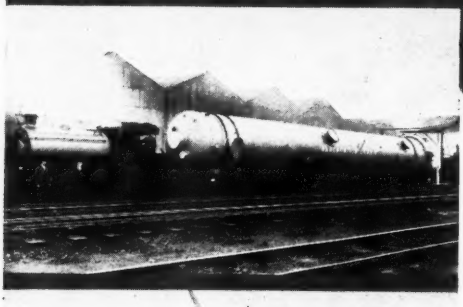

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ELECTRICAL REVIEW

Volume CXXX **No. 3357**

Friday, March 27, 1942

Contents

	Page
Editorial — Development and Economy.	389
E.D.A. in 1941	391
Underground Factory	394
Laminated Densified Wood. By A. E. L. Jervis	395
Electricity in Ahmedabad	397
Coal Conservation	398
Large Excavator	399
Institution Proceedings	401
Classified Advertisements	61
Improvisation at Hull	404
Correspondence	405
Personal and Social	407
Commerce and Industry	408
Electricity Supply	411
Financial Section	412
New Patents	418
Contract Information	419
French Electrical News	420
Forthcoming Events	420
Index to Advertisers	72

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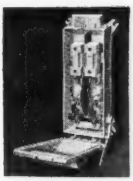

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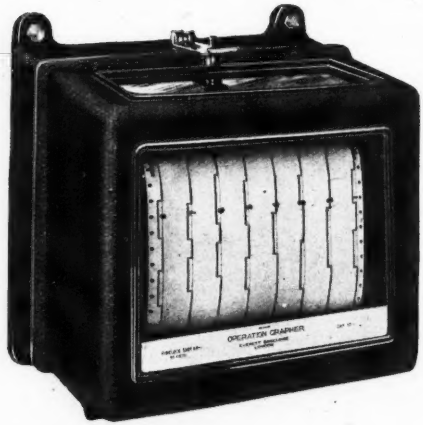

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXX. No. 3357. MARCH 27, 1942 6d. WEEKLY

Development and Economy

E.D.A.'s Wartime Activities

MR. E. E. HOADLEY, the new chairman of the E.D.A. Council, aptly compared the Association to a car in reverse gear when speaking at that body's last week's annual meeting. The *raison d'être* of the Electrical Development Association is the widest possible extension of the use of electricity. To-day it has to devote its energies to curtailing consumption or, at the best, educating consumers to make the utmost use of what is available.

Reasons for Continuing

There are some who feel that in such circumstances a Development Association is superfluous and, taking the short view, there is a certain amount of justification for that feeling. But, as has been pointed out before, it would be extremely unwise to abandon the experience gained during more than twenty years in the hope that after the war the Association could more or less begin again from where it left off. That, we think, is the principal reason for keeping E.D.A. going but in the meantime, of course, it must be employed on useful work. Primarily, it should be an advice bureau to which those who want to know how to use electricity in the most efficient manner can resort. With its depleted staff it is already doing much in this way.

The members cannot complain that E.D.A. is costing them too much. During 1941 only a quarter of the normal subscription was asked for and, as a result, there was a balance on the wrong side of the accounts. If it is considered worth while to keep the Association going, half the pre-war subscription (as proposed by Mr. F. Newey at the annual meeting) should not be thought excessive. The reserve, already not too big for post-war purposes, should not be eaten into by annual deficits.

For many months past the Association has played a leading part in the Mines Department's fuel economy campaign but now rationing is threatened, the President of the Board of Trade considering that "exhortation is not enough." It might be thought that this was another nail in E.D.A.'s coffin but actually it is nothing of the sort. The need for the education of the consumer will be all the more pressing and so there should be no slackening in showroom demonstration and lectures.

Post-War Planning

E.D.A. has been brought into post-war planning by a request from the Scott Committee to prepare a memorandum on rural electricity and the location of industries in country districts. There are now a number of bodies within the electrical industry dealing with these and kindred matters and Mr. Townley was amply justified when he asked that copies of the memorandum should be circulated to members so that those of them concerned with the matter in other connections would know what was going on. It seems that there are too many "planners" in the industry and there must be some sort of co-ordination of their activities to avoid overlapping and waste of time.

Another matter mentioned in the annual report was the work of the Electric Vehicle Committee. It is most unfortunate that at a time when a measure of independence of imported fuel could be gained by local transport, limitations upon the supply of steel restrict electric vehicle manufacture.

Engineering Training

IT was obvious early in the discussion at the I.E.E. on the education and training of engineers that two hours would be quite inadequate to allow all the members and guests who had constructive views on the subject to contribute their quota. Many authoritative voices have still to be heard and so the decision to resume the discussion on May 7th was a wise one. Full discussion is especially important in this instance, since the paper presented by Dr. A. P. M. Fleming may be regarded to some extent as an interim report and in the final recommendations of the I.E.E. sub-committee dealing with the matter due weight will be given to the criticisms and suggestions made during the two evenings and also to any written contributions.

Evening Classes

SUPPORT for the view that evening classes after a hard day's work in the shops provide an unsatisfactory means of acquiring technical training is to be found in the chairman's address to the I.E.E. Tees-side Sub-Centre. Mr. H. V. Field, who speaks from many years of experience in technical education, points out a possible cause of opposition to the release of apprentices for part-time courses during the day. It is that apprentices are paid on a higher scale than was once usual. This is, of course, justifiable where they are treated merely as production units, but it should be the first concern of any national apprenticeship scheme to abolish that attitude towards training.

Is Rationing Possible?

SIR WILLIAM BEVERIDGE and Sir Stephen Tallents have been asked to study the rationing of coal, gas and electricity and the supply industry will await their proposals with interest and some apprehension. The matter has already been considered by the Joint Gas and Electricity Committee which came to the conclusion that the compulsory restriction of gas and electricity consumption was, if not impossible, likely to prove extremely difficult. Moreover, so far as electricity is concerned the Committee calculated that the maximum saving of coal under the original rationing Order would have been about 0·5 per cent. of the total mined.

Demand and Consumption

IT is the kilowatt, not the kilowatt-hour, which matters—the prevention of domestic additions to the industrial peaks. So far as we can see, the only feasible means of dealing with this is to cut off domestic supplies completely at certain periods. This method has been employed on the Continent; is it desirable to apply it here? Possibly the system advocated by Mr. A. P. MacAlister, of Islington, in a letter in this issue would be workable, *i.e.*, the imposition of a fine in the form of an extra charge on excess consumption. The drawback is that an extra charge would not worry the wealthier consumers who in any event are more likely to exceed the ration than those who have to be careful of their pence.

Cable Tests

LEARNING from breakdowns is part of the art of every supply engineer, but it is far preferable for the breakdowns to occur in a laboratory than in service, a technique being acquired for interpreting the results. Those more particularly who operate cables in series with high-voltage overhead lines will find many points worth considering in the report of the E.R.A. tests on the impulse strength of 10 to 66-kV cables which Mr. R. Davis contributes to the February number (Part 2) of the *I.E.E. Journal*. Thus, provided the voltage is less than that causing puncture, repeated applications appear to have little effect irrespective of wave shape and also of the age of the cable. As only two makes were examined, definite conclusions must await the results of further experiments.

Petrol Vapour

CONTROL rooms of aero-engine testing plant are usually sound-proof structures where petrol vapour is likely to be concentrated in the event of leakage. Yet, on account of space limitations, the essential electrical equipment of those in existence is hardly ever flameproof. As a first measure improved ventilation by means of flameproof exhaust fans is recommended by factory inspectors. The air must flow away from the electrical equipment towards the petrol apparatus.

E.D.A. in 1941

Annual Luncheon and Meeting

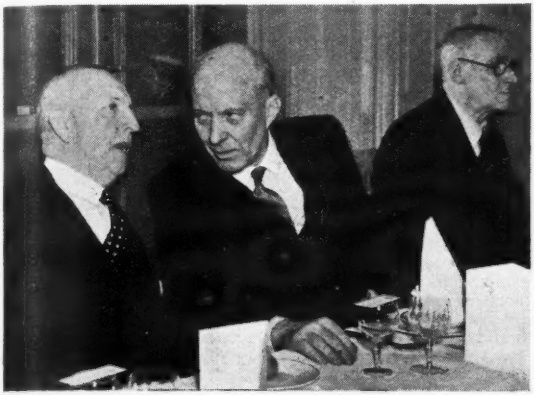
THE principal guest at last Friday's annual luncheon of the British Electrical Development Association at the Savoy Hotel, London, was the President of the Board of Trade (Mr. Hugh Dalton). Alderman A. A. Senington (Bristol), the president of E.D.A., took the chair and the company included representatives of all branches of the electrical profession and industry.

Apart from the loyal toast there was only one other, "The Electrical Development Association," which was proposed by Mr. Dalton. He expressed his appreciation of the share being taken by the electricity supply industry in war production and paid a special tribute to the work of the Central Electricity Board. If the grid had not already been in existence, he said, it would have been necessary to build one hastily. It had proved a valuable piece of foresight and great credit was due to Sir Andrew Duncan who had guided the Central Board through its earlier years.

One great attribute of electricity was its adaptability which would be an important factor in the location of industry and the dispersal of the population. Great cities were a great mistake and the pre-war advance of electricity had given a reasonable hope that industries could be developed in other parts of the country—particularly in the depressed areas. Electricity would have a great part to play after the war; its absolute necessity had been proved by the continuous rise in the production curve when other industries had experienced declines.

So far during this war the industry had come through well. Some damage had been done but it had been rapidly repaired by those responsible. We might have to go through more serious times but we should bear adversity as our Allies had done.

Introducing the subject of fuel and power rationing, Mr. Dalton said he believed that the people were anxious to be told what they should do as their share. Supplies of fuel must be fairly distributed and so he had decided to institute a rationing scheme. This might be disappointing to those who had been carrying out the fuel economy campaign, but although their work was appreciated propaganda and exhortation were not enough. Ministers were expected to take decisions and enforce them. Therefore Sir William Beveridge had consented to prepare a plan combining efficiency and equity to secure the better use of fuel and

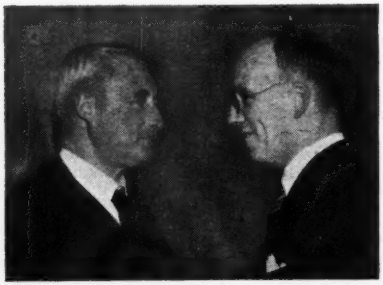


At the top table: Mr. A. J. Fippard, Mr. Hugh Dalton and Alderman A. A. Senington

Mrs. H. Bentham, the Dowager Lady Swaythling and Miss Caroline Haslett

power. He understood that Mr. Fippard, the chairman of the Association's Council, was consulting the Joint Gas and Electricity Committee regarding a scheme to present to Sir William Beveridge, who would also consult representatives of the housewife. Rationing of coal alone would have been most unfair and so he had decided upon a comprehensive scheme.

Mr. Dalton then commented upon the



Messrs. V. Watlington and W. N. C. Clinch

remarkable increase in the efficiency of electricity generation during the past few years and said that the industry had shown its adaptability to changing conditions. During the dark days of last winter production had proceeded with very little interruption and should such a crisis recur the same calm and resolute spirit would be displayed.

Members of this important branch of the country's economic life and war effort would be entitled to look back with satisfaction upon their work and they would play a leading part in the better times which lay before us.

In the course of his response to the toast, Alderman Senington said that he

Mr. Harold Hobson, Mr. J. W. J. Townley and Sir Noel Ashbridge

was glad that consultations were taking place before the introduction of a rationing scheme, for the Government had so often acted without consultation.

After a reference to the rapid and enormous growth of the industry, the speaker said the Association was doing what it could to keep its head up. Food advice bureaux had been set up in electricity showrooms all over the country and demonstrations had been arranged for imparting helpful advice to housewives. While they were doing 'all they could during the war they would be ready to do much more afterwards.

Annual Meeting

Alderman Senington presided at the subsequent annual meeting (the twenty-second) when Mr. A. J. Fippard (chairman of the Council) presented the accounts and drew attention to the outstanding items. Mr. F. Newey in proposing the adoption of the accounts pointed out that the amount received in subscriptions was only about 25 per cent. of the normal sum. He considered that the reserve of about £10,000 was very small to meet the needs of the post-war period. Members should agree to pay at least 50 per cent. of the normal subscriptions during the current year. Mr. J. Harwood Lumsden seconded the motion, which was carried unanimously.

In presenting the Council's report for 1941 Mr. Fippard said that the past year's work had practically all been done for Government Departments. All electricity supply authorities, whether members or not, had been assisted, and a great deal of goodwill had thus been created. Members had been helped considerably in connection with various Government Orders and similar matters.

He paid a tribute to Mr. V. W. Dale, the business manager, for the great amount of valuable work that he had done. The economy campaign had not proved so successful as it might have been and, as a result, they were faced with the prospect (not entirely a certainty) of rationing.

The work of the mutual aid groups organised by E.D.A. had been much appreciated by both members and non-members. The Electricity Commissioners had also been very helpful.

While there was no shortage of space-heating apparatus (good and bad) the position

with regard to kettle and cooker elements was not so good. The Association's efforts to obtain increased supplies were now bearing fruit.

Mr. J. I. Bernard had prepared an excellent report on electricity in post-war planning for Lord Justice Scott's Committee. The industry had to take a broad-minded view or it would be faced with schemes prepared by people outside the industry.

Mr. Cramb and his depleted staff were to be congratulated on the way in which they had kept the Association's services going. The control of the London School of Electrical Domestic Science had been taken over

Col. J. C. Dalton

Messrs. A. E. McKenzie and A. C. Cramb

and Messrs. E. E. Hoadley and C. Parker had been appointed directors of the company. The services of the principal, Miss Minoprio, were being employed by the Association for such time as the school was closed.

The South-East and East England Area had been divided into three sections—Greater London, Eastern Counties and Southern Sections. A Vehicle Standardisation Committee had been set up with Mr. Harold Young as chairman and Mr. R. Birt as vice-chairman. In conclusion Mr. Fippard said that the Health and Cleanliness Council had done much valuable work.

Other points in the report were an increase of one in the membership, making the total 390. The subscriptions brought in £29,576, against £61,983 in 1940. The income and expenditure account shows an adverse balance of £4,521; for 1940 there was a surplus of £950.

The Association circulated over half of the total number of official window displays issued by the Ministry of Information; 550 sites were provided and 11,000 displays, were distributed to members; these were of considerable assistance at a time when ordinary display material was unobtainable.

Much work was done in connection with the electric heating of shelters and the employment of electrical equipment in shelter feeding arrangements and in British Restaurants. In connection with the mutual aid schemes E.D.A. arranged with the Ministry of Food for the provision of emergency rations to 312 supply authorities for workmen engaged in repair work after enemy action.

National Press advertising was suspended, but in the early autumn advertisements dealing with canteen cookery were inserted in appropriate journals and, in conjunction with the Electric Vehicle Association, a limited advertising programme was carried out in selected trade journals. Local advertising showed a considerable increase, due in part to the co-operation of local supply authorities in the campaigns of the various Ministries.

Further editions of the Association's Register of Surplus Stocks were issued and, in some sections, particularly domestic appliances, the demand for apparatus soon exceeded the supply.

The film service experienced an increased demand and two new editions of "Modern Factory Lighting" were issued jointly by the Association and E.L.M.A. largely as the result of demands from Government Departments and industrial organisations.

Circumstances have combined to increase the demand for electric vehicles, but the shortage of steel has restricted production. Within the limits imposed there was a fair output. The report concludes with a reference to the work of the Electrical Association for Women and the usual tables analysing membership, subscriptions and expenditure.

Mr. E. E. Hoadley, the new chairman of the Council

In proposing the adoption of the report, Mr. E. E. Hoadley (who is this year's chairman of the Council) said that at present the Association was like a car running in in reverse. Some of the members of the Council had almost lived with Government Departments during the past year and some of the Departments had proved very difficult. Altogether it had been a very strenuous year.

He admitted Sir William Beveridge's remarkable abilities in many directions, but questioned his qualifications to deal with electricity rationing. He anticipated that rationing would prove a very difficult matter. Although a "truce" existed between gas and electricity undertakings he warned

members against the proposal to form a Ministry of Fuel. The motion was seconded by Mr. J. E. Nelson, who paid a tribute to the Council, the Director and the staff.

Mr. J. W. J. Townley, referring to electricity in post-war planning, said that other bodies were preparing memoranda for the Scott and Uthwatt Committees. Members should be given copies of the E.D.A. report, with the Scott Committee's permission, so that the views of the industry could be co-ordinated. Mr. Fippard said that the suggestion would be taken up; the Association had not been invited to prepare anything for the Uthwatt Committee.

Mr. L. Robinson dealt with the question of rationing and said that there was a terrible waste of electricity by the Services and in factories. He mentioned one very large factory which he had visited where he measured an illumination of 23 ft.-candles at floor level. He said that in spite of the "truce," the gas interests in his area were carrying on extensive advertising. (The chairman pointed out that the "truce" applied only to the national Press.) Mr. Robinson spoke very highly of the assistance given to Liverpool by surrounding authorities after air raids. He also mentioned the success which his undertaking had obtained in the equipment of communal kitchens.

After other members had attested to waste in factories, etc., Mr. Fippard said that the attention of the appropriate authorities had been drawn to the matter. The report was adopted.

The chairman then reported the re-appointment of Alderman Senington as president and of Alderman Dudley Stuart, Col. S. E. Monkhouse and Councillor A. Lester Boddington as vice-presidents. Mr. Townley moved a vote of thanks to Alderman Senington for his services during the year; Mr. C. Parker seconded the motion and the vote was accorded with acclamation. Alderman Senington responded.

A vote of thanks to the retiring chairman of the Council was proposed by Mr. R. Birt, and Mr. A. W. Barham seconded it. Mr. G. R. J. Parkinson proposed and Mr. J. D. Spark seconded a vote of thanks to the technical Press, chairmen, and other officials of Area Committees and Circles and Mr. Cramb and his staff.

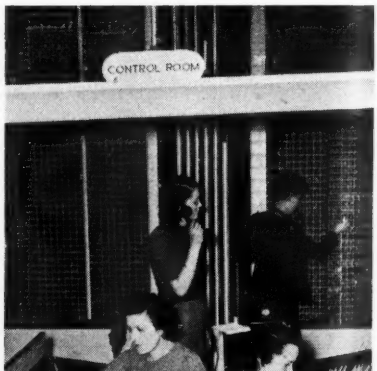
An Underground Factory

AN illustration in the article on this subject in our issue of March 13th showed girls at work in one of the Ministry of Aircraft's underground factories. This particular factory is self-contained, complete with its own underground substation and telephone exchange. An offshoot from one of the main galleries was of an ideal shape and size for conversion into a substation and in it was installed the e.h.v. gear, transformers and l.v. switchgear. Main paper cables for lighting and power were taken from the substation to a switch room built above the junction of four main galleries and from this point ring sub-mains were taken above the ceiling to feed the various lighting and power boards distributed throughout the machine galleries.

Fluorescent lighting has been installed throughout, and the pleasant simulation of daylight makes it difficult to appreciate that the factory is actually underground. A maintained emergency lighting system consisting of batteries with a "Tungar" charger is also provided.

Administrative offices built in one of the galleries are also provided with fluorescent lighting in the form of laylights, and what was at one time a seepage pit has been turned into a control room (illustrated). In this room is recorded the state of production throughout the works and in order that the closest possible check can be kept this room is linked to every department by means of Ediswan "loudspeaker-phones."

The whole scheme of electrification for this important undertaking was designed by engineers of the Edison Swan Electric Co., Ltd., and it is hoped that when circumstances permit it will be possible to publish details of many interesting problems which had to be solved to make the installation foolproof and efficient in every way. Lighting fittings, lamps, loudspeaker-phones, "Tungar" emergency lighting equipment, batteries, paper and v.i.r. cables were all supplied by the Edison Swan Co.



Production control room in an underground factory

Laminated Densified Wood

Insulating Properties and Tooling Applications

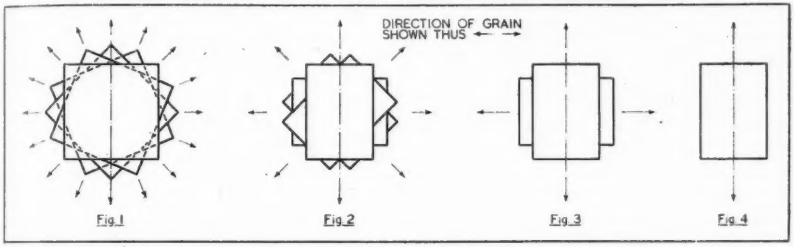
By A. E. L. Jervis

ORDINARY wood is an electrical insulator, though in most cases of a secondary class, suitable for bell-push bases, cable racks, blocks for dynamo and transformer windings, operating rods for circuit-breakers, etc. Although not really good insulators, oak cross-arms on poles carrying overhead power lines are of considerable value when the phases are widely spaced; when supporting strings of porcelain insulators they improve the impulsive flash-over limit of power lines. Examples of special woods are (hard and heavy) lignum vitae bases of railway track switches and (soft and light) redwood formers for high-frequency inductance coils of large diameter.

Such different treatment as varnishing, creosoting, or tallow impregnation, are still not altogether satisfactory; numerous attempts have been made to resin-impregnate wood satisfactorily, sometimes without resorting to compression.

In contrast to the mechanical insufficiency of "solid" wood, laminated "densified" varieties are very strong and can be good electrical insulators, resisting corrosion and acid as well as moisture absorption. Those varieties produced under greatest pressure with the largest resin impregnation content appear to afford best results in the last-mentioned respect. They can be substituted for metals, being more suitable (one-sixth the weight of steel) in some cases, easier to machine and modify, and more quickly produced in a variety of thicknesses and shapes, so lending themselves to mass fabrication. They have long been known as plywoods in many trades. Their earliest electrical uses included phase barriers and tank linings in oil circuit-breakers; they were chosen because of lightness combined with rigidity. Little insulation value is necessary for such physical separators, since they naturally assume the dielectric strength of the switch oil in which they are immersed.

Better qualities of composite wood, developed on the Continent, have been manufactured in England for some years. Two varieties are made by Moulded Components (Jablo), Ltd. Both are produced hot under pressure, "Jabroc" consisting of alternate laminations of wood veneers and glue films, primarily for mechanical superiority when electrical stressing is slight, whereas the dielectrically better "Insul-Jabroc" consists of impregnated veneers only, and is essentially an insulator for use indoors and out-of-doors, or under oil, in the ordinary manner. Complicated processing involves rigid control, choice of raw materials is important, varying types of veneers, beech, birch, mahogany, poplar, spruce, etc., being utilised for securing different results.



Figs. 1-4.—Diagrammatic representations of laminated veneer arrangements

Laminated "densified" woods can have tensile strengths up to 34,000 lb. per sq. in., with compressive strengths between 18,000 and 30,000 lb. per sq. in. depending upon veneer orientation with respect to the direction of the grain of the wood. Fanwise arrangement of the veneer laminations (fig. 1) is suited to the manufacture of circular articles; 45 degree stacking (fig. 2) is a simplification, while the 90 degree arrangement (fig. 3) is the standard for aircraft tool

TABLE I—WATER ABSORPTION OF RESIN-IMPREGNATED WOOD

Water absorption after 24 hours	Pressure lb. per sq. in.	Resin content %	Thickness inch	Specific gravity (density)
1.45	1,200	55	.067	1.36
5.4	500	55	.063	1.97
5.8	1,200	40	.048	1.27
8.5	500	40	.053	1.15

material. The simplest possible formation (fig. 4) with all laminations and grain directions placed parallel to each other is the best for producing articles that will be subjected to bending and tension stresses.

TABLE 2—"JABROC" COMPARED WITH A FEW METALS

Weight per cu. ft.	Material	Ultimate tensile strength lb. per sq. in.	Ultimate compressive strength lb. per sq. in.	Tensile strength divided by weight
454	Cast tin	3,500	6,000	8
159	Cast aluminium	15,000	12,000	94
449	Cast iron	15,000	80,000	33
536	Cast brass	24,000	30,000	44
532	Cast gunmetal	32,000	20,000	58
87	"Jabroc"	34,000	23,000	390
486	Structural steel	60,000	60,000	123

The electrical puncture strength of "Insul-Jabroc" is indicated by tests (B.S.S. 316, one minute at 35 kV) on two 0.25-in. boards selected at random, each consisting of 21 veneers of beech wood; puncture occurred at 65 kV when impregnated with cresol resin and at 62.5 kV with phenol resin.

Numerous applications of "densified" laminated wood are generally similar to

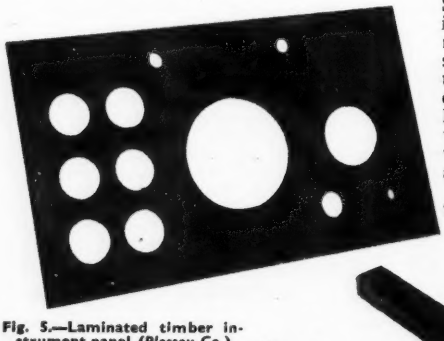


Fig. 5.—Laminated timber instrument panel (*Plessey Co.*)

all those of the better known moulded plastic substances. Typical electrical examples are instrument panels in which case the great strength of "Jabroc" material is advantageous when shock loads occur, as during gun-fire on board ships. High- and low-voltage tongues made of "Insul-Jabroc" are used for removing patent "Eetee" fuses, while an interesting instance of the employment of laminated compressed wood as a secondary dielectric is insulator spindles for overhead power lines. The considerable side loading to which they are subjected by wind and ice formation is the reason for normally employing steel spindles, although wood equivalents of sufficient strength would be much better electrically, because the unfavourable electrostatic field distribution caused by the metal in pin-type insulators is responsible for many disturbances in fog and dirty weather.

Over-stressing of certain portions of outdoor porcelain insulators causes contaminating deposits to form unevenly over the surfaces, which is frequently the first stage in electrical breakdown, apart from inducing minute spark discharges that interfere with radio reception.

TABLE 3—"JABROC" COMPARED WITH A FEW WOODS

Weight	Specific gravity	Weight per cu. ft. lb.	Ultimate tensile strength lb. per sq. in.	Ultimate compressive strength lb. per sq. in.	Shear strength at right angles to fibre	Shear strength parallel to fibre
Spruce ...	0.48	30	9,000	4,500	1,200	800
Beech	0.75	47	18,000	9,000	2,140	1,250
Ash	0.77	48	15,000	7,000	1,200	800
Oak	0.8	50	13,250	5,760	3,890	1,080
"Jabroc"	1.4	87	34,000	23,000	7,300	3,000

Such conditions as these might be changed if wood spindles were substituted, the non-metallic properties of which would avoid strong electrostatic field concentration in the pin holes, so that better distribution of electrical stresses over the porcelain insulators would result. The "densified" wood spindle illustrated successfully withstood test loads of 400 lb. without appreciable permanent set.

The citing of laminated wood's service to the aircraft industry, with which so many electrical concerns have wartime associations, will not be irrelevant if experience gained

Fig. 8 (right).—"Densified" wood spindle for overhead line insulator

Figs. 6 (left) and 7.—Compressed wood tongues for high and low voltage 300 A "Eetee" fuses (*Electric Transmission, Ltd., and Johnson & Phillips, Ltd.*)

therefrom can be referred to post-war tooling requirements of the electrical and allied trades. Apart from " Jablo " airscrews competing in strength with metal aeroplane propellers and ventilating fan blades, in addition to their ability to withstand corrosion, tools made of compressed wood for machines fashioning aircraft components range from drill jigs of all sizes up to 6 by 3 ft. to spinners several feet in diameter for shaping the cowlings of aero-engines, bending blocks, profiling plates, routers, press and blanking tools.

The last-mentioned have their actual cutting edges faced with steel, but even so some 90 per cent. of the whole tool is made of composite wood, the lightness of which can be an important factor in respect of the increasing amount of female labour being employed in factories. In some cases in which girls have been unable to handle large steel drill jigs, for instance, the introduction of laminated materials may effect up to 80 per cent. saving in tool weights.

In other cases in which aircraft tools are needed for producing relatively small quantities of components, the use of heat-treated steel tools involving heavy preparatory processing costs cannot always be justified. Tools for such short-term requirements are quickly made more economically of " densified " wood ; this is worth bearing in mind in view of the frequent changes in design that characterise aircraft work which render the alteration of steel tools a major consideration, whereas laminated wood tools can be modified quickly and cheaply.

Fig. 9.—Large laminated drilling jig one-sixth weight of corresponding steel jig

Electricity in Ahmedabad

Large Growth in Industrial Load

AN account of the way in which electricity has helped in the modernisation of the progressive city of Ahmedabad during the past twenty-seven years is given in the *Indian Textile Journal*. The electric fan has ousted the old-fashioned pull punkah; electric refrigerators and cooking appliances are becoming increasingly popular—there will no doubt come a time when the ice box and the *segri* will be the exception rather than the rule; the conditioning of hot dusty atmospheres has come to stay; and the electric motor has been harnessed to small machinery of all descriptions. The most striking advance has been in the field of industrial power supply, and more and more mills and factories have taken power from the Ahmedabad Electricity Co., Ltd., on account of the cheapness and reliability of the supply.

After the completion by the company in 1934 of a steam station with two 3,750-kW sets the consumption of electricity for all purposes increased to such an extent that a 7,500-kW turbo-generator set was installed in 1936 and another of the same capacity early in 1939, bringing the total capacity of the station to its present figure of 22,500 kW, and preparations are being made to install and operate a fifth 7,500-kW turbo-generator which, it is hoped, will arrive shortly. A sixth of the same size has been ordered, making the total capacity 37,500 kW, a big increase on the three 94-kW sets which represented the company's total capacity until 1926.

To-day there are 19,540 consumers connected, 235 miles of street illuminated by 8,237 street lamps, and 35 mills and factories taking supplies. Industrial power consumers now number thirty-five with a connected load of over 19,000 kW and a consumption amounting in 1940–41 to over 49 million kWh.

In the textile industry millowners certainly appear to appreciate the great advantages to be derived from electric power, while as regards small industries and lighting and fan consumers, it has always been the policy of the company to encourage to the fullest extent the many uses of electricity. It is felt that the abolition of the minimum charge coupled with successive rate reductions would have made it possible for any consumer, no matter how small his needs, to avail himself of electricity, had it not been for the levy of electricity duty on the energy for lighting and fans introduced by the Government in 1933 and increased in 1936 and again in 1939. The present tax is over 40 per cent. of the energy charge.

Waste paper is an urgent war need

Coal Conservation

Introduction of Rationing Schemes

IN the House of Commons last week the Secretary for Mines presented a survey of the coal situation in order to prove the need for drastic economies in the consumption of coal, electricity and gas. He said that in spite of the severities of the last three winters and other adverse circumstances no undertaking essential to the prosecution of the war had been stopped for want of coal or power and present stocks for essential industries were now on an average as good as last year.

Referring to quality, he said that the first charge on the restricted supplies available must be for undertakings for which particular types were necessary. In consequence there had been numerous complaints from lower priority consumers, but disappointment was unavoidable. After dealing with the measures that had been taken and were being taken to improve output, Mr. Grenfell said that next winter's consumption would be heavier and it was not sufficient to rely entirely on greater output. The ordinary consumer would have to exercise greater economy.

Sir William Beveridge to Report

In the course of the debate it was suggested that neither owners nor miners were doing their utmost to better the situation and that the Government should find out why the quality was far below the pre-war standard.

Mr. Dalton, President of the Board of Trade, said that consumption had to be cut down and mere exhortation was not enough. The Government had decided to introduce a comprehensive rationing scheme as soon as possible. Sir William Beveridge, who would be assisted by Sir Stephen Tallents, had been asked to report on the most effective and equitable method of restricting and rationing the consumption of fuel and power. He did not, however, intend to await this report before taking steps to cut down fuel consumption and already coal deliveries were being restricted.

In the meantime he took the opportunity of making an appeal—which would be followed up in due course by a regulation—to all domestic consumers of coal and electricity at once to reduce their consumption and not to insist on having too many lights or having unnecessary fires burning in an unnecessary number of rooms on days which were not very cold. Further, he appealed to those in charge of shops, hotels, boarding houses and public buildings which, in total, consumed a great quantity of electricity for heating and lighting, and particularly for display lighting which he thought was out of place in wartime.

Sir Joseph Nall (who is chairman or director of a number of electricity supply companies) considered that the sale of electric radiators ought to be limited and further production might very well be suspended. The same applied to cookers, although they were very largely restricted and the position was not so serious. Lighting in public places should be reduced, including the House of Commons itself and the London Underground stations. The President of the Board of Trade was up against the snag of how to ration houses. If they were rationed by units there was no control over the time of day when a person used his units. The whole difficulty was getting the peak loads cut off. The only thing to do was to bring in a regulation limiting the size and number of lamps which consumers might have. The sale of lamps of more than 60-W except for workshops and special places should be stopped.

Original Rationing Order

It may be of interest to summarise the main provisions of the Fuel & Lighting Order issued in 1939. It applied to non-industrial premises and industrial premises in which the annual consumption of coal or its equivalent was not more than 100 tons in the year ended June 30th, 1939. One ton of coal was considered to be equivalent to 100 therms of gas or 1,400 kWh. The Order did not apply to consumers obtaining electricity through a lighting prepayment meter or those whose consumption was not more than 200 kWh a year, or where cooking was exclusively electrical 1,000 kWh a year.

The "ration" was fixed at 75 per cent. of the consumption during the year ended June 30th, 1939. Where the consumption in any quarter exceeded the permitted quantity the supply undertaking was directed to notify the local fuel overseer who might order the undertaking to disconnect the supply for a period.

Standard Drawing Sheets

PROPOSALS for the standardisation of drawing office papers and cloths have been made by the Drawing Office Material Manufacturers' and Dealers' Association. Generally speaking, the recommended ratio of breadth to depth is $\sqrt{2}$ to 1 with an allowance when the sheets are required for binding. A margin for trimming is allowed in sensitised sheets for printing where this is considered necessary. Eight sizes are listed ranging from 54in. by 38in. (55in. by 39in. for sensitised sheets) to 6¾in. by 4¾in. (7¼in. by 5¼in.). Copies of the proposal have been sent to the British Standards Institution and the Paper Controller.

Large Excavator

Electrically Operated Plant for Quarrying Deep Overburdens

A FIRST impression on climbing into the "machine room" of the overburden excavator at the workings of the Irchester Ironstone Co., Ltd., was the size of the "cabin" which we associate with smaller excavators, for the room is 45 ft. long by 30 ft. wide and 15 ft. high, while spanning the mass of motor equipment, high- and low-voltage switchgear and the mechanical winding and other equipment is a 15-ton overhead crane—a veritable power station indeed. Actually, at the front of the plant room there is a separate operator's cabin, containing the control equipment for all the operations. The excavator travels under its own power, running on rails which are built up in 6ft. lengths on sleeper mats. As the excavator is moved up to the face two mats complete with bogie tracks are picked up from the rear and transferred to the front by means of a 5-ton hoist which is mounted on the 104-ft., 90-ton boom of the excavator proper.

This large excavator digs the overburden and dumps on to ground from which the ironstone has been removed

The immense underframe of the excavator, which is 31 ft. square by 5 ft. deep, is supported at each of its four corners by a four-wheeled truck which is separately driven from a propelling shaft *via* pinion and spur gearing. Levelling the underframe in spite of an uneven track is afforded by 24-in. diameter hydraulic equalising cylinders, one on each propelling truck, which carry the main weight. These are served by a motor-driven hydraulic pump mounted on the frame itself and supplied electrically from the low-voltage transformer on the revolving superstructure through a set of auxiliary slip rings. The cylinders may be operated independently or any two may be operated together while the other two are sealed.

In last week's article on "Heavy Quarrying," we referred to the mammoth excavator as a development which has somewhat revolutionised quarrying operations where there are deep overburdens, at least from the economic aspect. Details are now given of the electrical installation and operation of the excavator, which weighs over 600 *tons, houses about* 500 *HP of motive equipment and has a dump radius of* 114 *ft.*

The travelling motion is provided for by the hoisting equipment; so, omitting the former motion as supplementary, the three main actions of hoisting, slewing and crowding are all cared for by separate DC motors or motor groups, all supplied from the separate generators of a multiple-generator m.g. set, so as to afford the advantages of the Ward Leonard system of control of the motors. But these advantages do not lie wholly in mere speed regulation, for the problem of motor stalling, particularly in the case of the crowd motion, becomes specially acute in these drives, and in consequence the drooping characteristic is especially emphasised.

There are five units on the m.g. set, which is situated right across the back of the machine room, namely, the 550-HP, 3.3-kV, 1,000-RPM synchronous driving motor; 275-kW, 135-kW and 135-kW DC generators supplying the hoist, crowd and slewing motors, respectively; and a 30-kW exciter which serves all the generator and motor fields. There are two 187-HP. 230-V shunt-wound DC motors for hoisting, which are arranged in series. They are situated both on one side of the machine room and one on each side of the hoisting drum, to which they are coupled through double helical reducing gear with diametrically opposed pinions on the motor shafts.

The 48-in. winding drum runs freely on its shaft and is coupled to the drive transmission gear by a friction clutch band which is operated by the ram of an air cylinder attached to the hoist gear arms. This clutch is only released

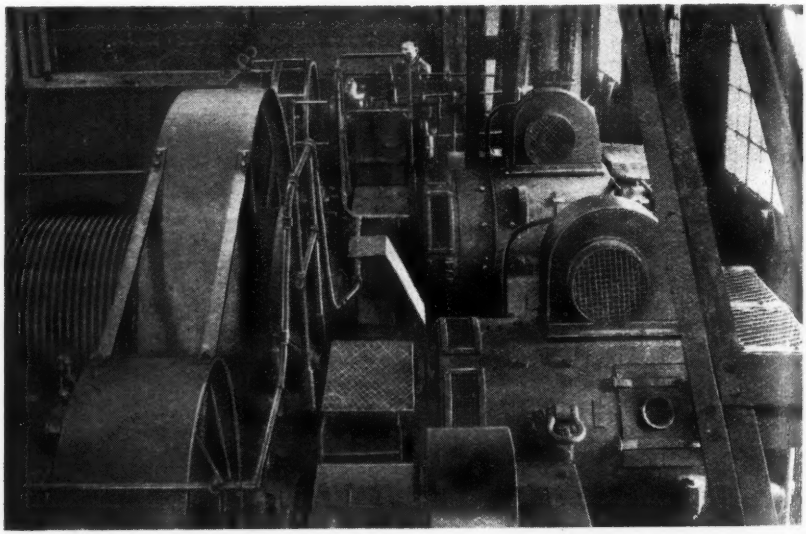
when it is necessary to travel the machine. The band brake controlling the winding drum is applied by weight, but released by compressed air controlled by electrically operated magnet valves. A compressed-air cylinder lifts the weight as soon as the controller is moved from the neutral position. Thus, in the event of a power failure the brake is automatically applied. All the motors are similarly controlled by brakes which are released by compressed air. In the case of the two hoist motors the brakes are applied by means of weights, but for the crowd motor and the two slewing motors the brakes are applied by springs.

Two 75-HP, 115-V DC motors provide the slewing motions and they are situated at diagonally opposite corners of the machine room, where they transmit their mechanical power through gear trains to opposite points of the slewing rack on the undercarriage. The transmission is first through a reduction gearbox to bevel gears and then to vertical shafts which pass through the rotating frame and engage the circular track by integral pinions at the lower ends.

As we have previously mentioned, the travelling power is provided for by the hoisting system. From the main drum gear wheel, transmission is first to a horizontal shaft in two sections coupled by an air-controlled dog clutch. The second section has a bevel engagement with a vertical shaft which further transmits *via* spur gearing to a final vertical propelling shaft in a central journal casting, thus providing for wear in the rail circles by allowing the teeth to slide over one another. From the vertical shaft transmission is *via* four horizontal shafts at the outer end of each of which is bevel gearing which transmits through reduction gearing to propelling shafts with telescopic sections and universal joints, so that the bogies can follow an uneven path.

The crowding motion is served by a 125-HP, 230-V DC motor mounted on a steel bedplate about 40 ft. or more up the boom. The motor pinion drives a spur wheel on an intermediate shaft which, in turn, drives the shipper shaft through a further gear reduction. Two pinions on the shipper shaft engage the racks on the bottom side of the dipper sticks. The hinged door of the bucket closes by gravity, but the door latch is operated for opening by a DC high-torque motor supplied from the excitor.

Air for the operation of the band brakes and other auxiliaries is supplied by a 28-HP, 440-V, AC motor-driven air compressor which is automatically operated by the pressure in an air receiver. All the main motors are of the mill type and arranged for regenerative braking, and they are forced ventilated individually by means of a 1-HP motor-driven blower units. The controllers for all the motors are of the simple tramway drum contactor type and are housed in the driver's cabin, while the low-voltage contactor gear through which the motors are operated is all housed in a separate steel cubicle.



The machine room showing hoisting motors on the right and m.g. set at the rear

A complete cycle of operations, including both digging and dumping, is carried out in an average time of less than a minute. The immediate feed for the excavator is *via* a 0.075-sq. in., 4-core, wire-armoured, c.t.s. 3.3-kV trailing cable which is connected to slip-ring connector gear on the undercarriage. The feed is then up through the centre of the main vertical travelling shaft at the centre of rotation to a high-voltage cubicle where it is distributed *via* isolating links, either to the auto-transformer starting equipment for the synchronous motor of the m.g. set, or to the 50-kVA transformer for the 440-V supply for the auxiliaries. A 110-V single-phase supply is provided for lighting.

INSTITUTION PROCEEDINGS

Producing Technicians and Craftsmen

THERE was a large attendance at the INSTITUTION OF ELECTRICAL ENGINEERS in London on March 19th, when Dr. A. P. M. Fleming presented his paper (to which reference was made last week) and the list of speakers was so long that the meeting had to be adjourned until May 7th.

Professor E. W. Marchant, in opening the discussion, said there was hardly anything in the paper with which he disagreed. He thought there should be more differentiation between training for the light and heavy engineering industries and while there should be a broad foundation of training in all branches of engineering for all engineering students it was necessary to have some specialised training which would be of value in interesting the student in the particular branch he was going to enter.

At Liverpool in the last year of the course students were asked to prepare a paper on some subject and it was read to the students who discussed it. This had proved of great value to the students and it also gave them a certain amount of practice in preparing and presenting reports. Another method was for students to present a thesis on some subject which they had previously been consulted about to ascertain whether it would be of interest to them in their future work.

Views on the Training of Engineers

Professor C. E. Inglis (President, Institution of Civil Engineers) said that the university type of education, catering as it should for those who would eventually occupy leading positions, should strive to develop in students breadth of vision and independence of reasoning, even at the cost of curtailing somewhat the time available for purely technological instruction. Engineering education of the university type and full-fledged technical training should not be attempted in the same establishment, but an avenue should be provided whereby a student who had shown special aptitude at a technical school should be given the opportunity of proceeding to a university and taking a less specialised course of engineering. It should generally be possible for a technical school to provide a course which would cover the first year's work at a university, and selected students at technical schools could thereby be prepared for a subsequent two years' course at a university. He hoped that in the future there would be a considerable flow of this character and that State bursaries would be provided to make this route available to all who had the necessary intellect, character and ambition.

In view of the many highly specialised developments engineering progress was bringing forth, post-graduate courses were becoming an increasing necessity. Training in industrial management should be an integral part of such courses.

Dr. W. Abbott (Board of Education) said an important question was whether craft training could now be given in all works ; if not, how and where should it be given? It might be necessary to distinguish between production and repair work as he imagined it took a very much better man to repair a damaged tank than it did to make it.

Mr. W. A. Stanier (Past-President, Institution of Mechanical Engineers) said he always felt that the craftsman was forgotten in such discussions. After all, the great majority of the students in technical schools would be mechanics. It was essential for any engineer to have a fundamental training as a craftsman, but there were far too few junior technical schools at which the grounding in the elementary technical subjects necessary to enable a student to become a competent craftsman could be obtained.

One post-war problem would be the enormous development in the work of planning in industrial undertakings, which meant that comparatively few skilled craftsmen would be used, and the great majority of the operatives would be merely machine minders. That would be a very poor training for an apprentice and it was more and more important that the large undertakings, indeed, some of the smaller ones too, should provide facilities in the form of an apprentice bay in which the young mechanic, or apprentice, would have one or two years to get thoroughly grounded in the use and abuse of tools, and also the material used.

Col. Sir A. Stanley Angwin (G.P.O.) said that education in engineering must be divided into two major types. On the one hand there was the skilled craftsman, the foreman, the tester and perhaps the draughtsman in one category and, in an entirely different category, the design engineer, the research and development engineer and the senior executive. There did not seem to be any prospect of getting a general scheme which would cover all these. It was imperative to have a full apprenticeship course in the workshop and it was necessary to stress more and more the value of craftsmanship in the electrical industry, and indeed, in engineering as a whole. What was needed by the second category was a broad general education in engineering, specialising in mathematics, physics and in the fundamentals of engineering science, and it was essential to keep clearly in mind these two widely differing objectives. He agreed with the author's plea that evening classes should be abolished.

National Apprenticeship Scheme

Mr. E. Watson Smythe (Principal Assistant Secretary, Ministry of Labour) said he was in charge of training under the Ministry of Labour and under the Government scheme it had been possible to train in 16 to 20 weeks people who had previously no idea what a file was. If that could be done, surely after this war they should overhaul apprenticeship schemes.

Professor C. L. Fortescue (City and Guilds) said he regarded the suggestions with regard to the national apprenticeship certificate as the most important constructive proposal in the paper. No educational scheme could be right when 60 or 70 per cent. of the entrants fell by the way before obtaining the National Certificate and only 11 per cent. reached the National Certificate stage. In 1938 he suggested to the Joint Examination Board of the Institution and the Board of Education an almost identical scheme to that now put forward, but it was not then sympathetically received. Now that it had the backing of Dr. Fleming's Committee it should be reconsidered by the Council at the earliest opportunity and not be regarded as a post-war plan.

As to education for the Higher National Certificate, that was where there was an opening for the bursary system. Only a few men succeeded in getting through the whole course when they had to work wage-earning hours during the day and were called upon at night to make a mental effort almost equal to that necessary in a three years' course for a university graduate. The best of the National Certificate students should be selected by a responsible Committee and given bursaries for two or three years in a university so that they might become experts in one branch or another of engineering.

Mr. H. J. Beard (Merz and McLellan) suggested that a student should have some works experience before going to the university. He suggested that lecturers at present had insufficient time for research in addition to carrying out their duties as lecturers and to overcome this difficulty part-time lecturers should be recruited from industry. This would give a stimulus to the life of the university and invigorate the permanent teaching staff by closer contact with industry. There should also be a system by which sufficient remuneration was paid to those who had not private means to enable them to take advantage of the facilities for entering works. The dangers of specialisation at too early an age did not seem to be sufficiently appreciated and more attention should be given to the economic aspects of engineering.

Mr. J. A. Sumner (Norwich Electricity Department) said that in the electricity supply industry there was, as yet, no scheme of training for employees. Yet there were 100,000 employees on that side of the industry. This was a very serious matter and there was an urgent need for an organised scheme of some kind.

The discussion was adjourned until May 7th, immediately following the annual general business meeting.

Heat Insulators

THERMAL conductivities of a variety of industrial materials are discussed and types of apparatus devised for making such determinations at the National Physical Laboratory described in a paper by Dr. Ezer Griffiths, Dr. R. W. Powell and Mr. M. J. Hickman, submitted to the INSTITUTE OF FUEL in London on March 19th.

Data are presented in respect of refractory materials, insulating bricks, granular and fibrous substances, mica, carbon, graphites and a number of metals, which should be of value when calculating heating rates and losses from furnaces and other plant. The packing under load of compressible materials is discussed and an account given of an experimental determination of the settlement of slag wool in a cavity wall.

Marked change in the thermal conductivity of certain phlogopite micas when raised to 200 deg. C. led to an X-ray examination which confirmed the explanation that the originally perfect plane crystal had disintegrated into numerous elements, themselves intrinsically perfect, but tilted so as to depart widely from the original formation. It is considered reasonable to suppose that the extra boundaries thus produced cause appreciable reduction of thermal conductivity. In applying the foregoing results it should be borne in mind that the laminæ of mica which is unloaded may tend to open up and that its heat conductivity would then be somewhat less.

The above effect is exhibited to a very marked degree by vermiculite, which is a special variety of exfoliated mica employed in coarse granules, or fine flakes, as a heat insulator at elevated temperatures. It is made by exposing small flakes of mica ore suddenly to high temperature so as to convert the water held between the laminations into steam, which expands the mica into cellular granules about fifteen times its original volume. The heating changes the colour of the ore from black to silver, or gold; the individual laminations of the granules, being smooth and bright, are believed to act as reflectors of radiant heat.

Turning to metallic conductors, the authors show the effect of impurities on the conductivity of iron to be less at high than at normal temperatures; in general, alloys are less conductive than their main constituent elements. The thermal conductivity of carbon is much less than that of metals, while one of the natural graphites studied had a conductivity exceeding that of copper at normal temperatures, but it decreased very rapidly with rise of temperature.

The possibility of deriving the thermal conductivity of a metal from knowledge of its electrical resistivity is indicated, though several metals which are fairly good conductors of heat are very poor electrical conductors. The Somerfield theory assumes that both thermal and electrical conduction are the result of electronic agencies.

Engineers and Management

THE relation of engineers to management was the subject of an address delivered by Mr. G. F. Anderson (Works Management Association) to the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS in London on March 17th. In order to convey some idea of the sizes of industrial concerns which engineers might be called upon to manage, or control, the speaker commenced by emphasising the ubiquity of small firms in relation to the factory system of this country. Classification of factories by grouping them according to the number of employees showed how surprisingly few were the concerns employing over 1,000 workers (only four factories in every thousand) whereas 97 per cent. of the 141,394 factories existing in 1936 employed fewer than 250 workers each.

Mr. Anderson considered that engineers who could blend organising capacity with training and experience should find many opportunities for management. Such men would mainly be technicians of mature years; however well developed their business or commercial training might be, they would need clear-headedness and courage to make the change-over from the technical to the administrative side.

There were few propositions in general manufacture that would not successfully yield to the logical approach and scientific analysis of the technician, provided he had sufficient industry and determination to "see it through." But there were many very able men who were constitutionally incapable of exercising managerial authority. When the essential qualifications were not forthcoming from within the organisation, the alternatives were either long and laborious training which, in the end, might not produce the desired result, or the bolder course of introducing "fresh blood at the top." Many large manufacturers, particularly those in the more highly specialised industries, were finding that narrow departmentalisation and concentrated routine work entailed in standardised mass production did not induce to the discovery of new men having the correct outlook; they did not easily acquire broad vision and diversified experience.

Lack of Definition

Misunderstanding of the work of the engineer, which was so frequent, was responsible for the confusing nomenclature in respect of titles and positions that often seemed to endow the works superintendent, or manager, in one organisation with more power and versatility than a director of another concern. It must be appreciated that administration was the phase concerned with the determination of policies and major objectives, whereas management consisted in the direction and control of activites with the object of attaining to the results visualised by the former. It followed that the scientific viewpoint of the engineer-manager was needed for balancing advantages against disadvantages as well as for assessing intangibles that must be allowed for. The engineer reached his conclusions following upon scientific analysis of co-ordinated data; it was not surprising that from the repeated soundness of the engineer's final decisions there had arisen confidence which was proof that such decisions were more than professional guesses.

Examples were quoted to illustrate the fallacy of adherence to traditional methods within different industries. Even large organisations would often maintain antiquated machines and processes when improved methods were known to exist; such mental laziness and unplanned thinking must cost a great deal of money. Many shrewd industrialists preferred to entrust new undertakings to engineers with business knowledge rather than to business men with engineering knowledge and, moreover, in the more recent formation of intricately technical industries it had become manifest that the professional company promoter was being rapidly superseded by lawyers and bankers who based their legal and financial surveys on the recommendations of their engineering investigators. Such an alliance of experts was able to deliver the best possible judgment.

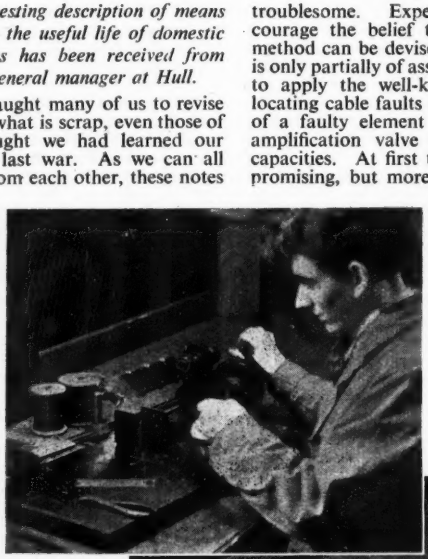
C†

Improvisation at Hull

Domestic Repair Shop Practice in Wartime

The following interesting description of means adopted to prolong the useful life of domestic electrical apparatus has been received from Mr. D. Bellamy, general manager at Hull.

THE war has taught many of us to revise our ideas of what is scrap, even those of us who thought we had learned our lesson during the last war. As we can all learn something from each other, these notes will perhaps be helpful directly in themselves and indirectly if they result in bringing to light other improvisations. Most of the work described has been undertaken because of war conditions and without regard to peace-time economics, but there seems no doubt that quite a large proportion can be profitably continued when more normal conditions return.



Left: Kettle element winder. Below: Welding cooker hot-plate

In the case of hot-plates, if the plate itself is too badly buckled or is cracked the only place for it seems to be the scrap heap. But refacing can be carried out to a far greater extent than had been usual so as to get at least a few more months' service. If a surface grinder is available it is possible to work to fine limits very easily with reasonable confidence and quite cheaply; this we now do. If the element is discontinuous but the plate casing is still serviceable the break can be located and the broken ends brought out, welded together and re-bedded in cement. Keene's cement will serve, though there are others more suitable for this particular purpose. Insulating beads make the work easier and give more confidence in the result. It is too early to say this is a perfectly satisfactory repair, but after so repairing several hundreds the results encourage us to carry on and extend the practice as greater skill and further experience may give encouragement.

The location of the break is sometimes troublesome. Experiments, however, encourage the belief that a "radiolocation" method can be devised; at present the device is only partially of assistance. It is an attempt to apply the well-known capacity test for locating cable faults to the very low capacity of a faulty element by the use of a radio amplification valve to measure those low capacities. At first the results seemed more promising, but more extended use gave less reliable indications and we cannot, at present claim completely to have fathomed the difficulties, still less to have overcome them. Women, whose engineering experience was previously confined to the kitchen, can be trained to this work; in fact, as in many similar types of work, with their more nimble fingers they soon become more adept than men.

A break in griller boilers is easy to locate and almost as easily repaired by welding. After so repairing several hundreds we can say with confidence that this repair is worth doing. This also applies to all other types of open elements. The welding apparatus has been made out of odd bits of resistance wire, switches, etc., and does its job excellently, so any lack of beauty in design is forgiven. The necessary spot welding is done with a heavy-duty l.v. transformer from obsolete plant.

We have been very successful in renovating and repairing the thermostats of the immersion heaters used on domestic hot-water systems. These frequently are found either out of calibration or altogether inoperative. In the first case, the device is opened out and the fault, which is due to accidental overheating having strained the metal, is remedied by suitable adjustments of either the metal or the calibrating knob, or of both. In the second case the contacts may be burnt or even welded together. The thermostat is dismantled and the contacts carefully filed flat with a jig guide and then polished in a lathe, one contact being made slightly concave at the same time. These repairs are perfectly satisfactory and far more than offset the loss of any guarantee by breaking the manufacturers' seals.

We have been fortunate in not being committed to immersion elements for kettles as the rewinding and repair of heaters on mica bases is a relatively simple operation. When war broke out we had a considerable stock of broken-down elements and mica which we had accumulated as possibly useful scrap, and since the war all have been saved for eventualities. By picking over this mica and in many cases using only about two-thirds per element we have reconstructed many hundreds of elements which have proved perfectly satisfactory in service. The resistance wire is crimped and the element wound on a simple "home-made" winder constructed from odds and ends such as small motor bearings and "Meccano" parts which gives far better results than winding on a lathe and is designed to support the mica to withstand the strain of winding.

Much of the renovation of wash boilers is now carried out without the assistance of the manufacturers, and the reinforcement of the tinning by electro-deposition has proved very successful.

Rod and solid shelves of cookers are now shot blasted and this has been found an excellent method of renovation. The shelves should be put into commission quickly after the shotblasting, and it is then found that there is no trouble through rusting. The appearance of the shelves after this treatment is excellent.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Proposed Rationing of Electricity

THE Government have indicated that they will introduce, at an early date, a rationing scheme for electricity, gas and coal. Having had the previous proposed operation of the Government's provisional rationing scheme in mind, and its possible impracticability, I would commend for serious consideration the following alternative :—

Consumers would be permitted the use of electricity for lighting, power, heating, etc., but they would be limited to a percentage of the corresponding quarter's consumption at the standing tariffs of the supply authority operating at the time of their account being rendered. Any excess of such permitted percentage would be charged at an increased standard price per unit to be fixed by the Government. (This should be at a rate to prevent abuse by individual consumers.) The revenue derived from this excess charge would, less a small percentage to cover additional cost entailed by the undertaking, be credited to the Government and thus, in itself, be the immediate collection of the penalty for having exceeded the allowed ration amount.

This scheme would minimise the additional work of the undertakers who have now only a very small restricted and, in some cases, incompetent staff to deal with any rationing scheme by the fact that once the percentage of units which was to be charged at the basic rate had been fixed, the balance of units registered on the indices would be those charged at the increased rate. No difficulty or friction would then arise in endeavouring at some date after the offence had been considered to penalise consumers either by threatening to disconnect the supply or by prosecution.

Of course, in fixing the percentage of the corresponding standard quarter's consumption, regard must be paid to localities which have suffered from enemy action and the fact that many retailers and householders have not the benefit of natural light and, consequently, have to use artificial light to a greater extent than would have been the case under normal conditions.

Islington. A. P. MACALISTER,
Borough Electrical Engineer.

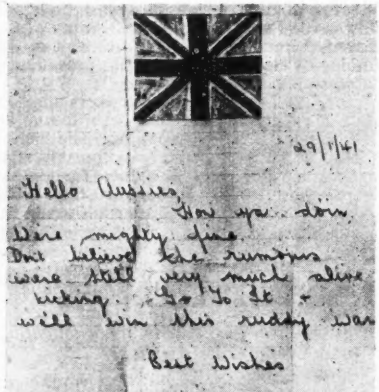
A Message to Australia

ON January 7th this year the Unpacking Department of Oliver J. Nilsen & Co. Pty., Ltd., Melbourne, Victoria, discovered a small pencilled letter under a crayon drawing of the Union Jack. A photographic copy of the letter is enclosed. You will see that the date is within the period of the concentrated enemy "blitz" on England. On reading the letter you will agree that it is an inspiration to the Empire's common war

effort and the complete answer to the abortive Nazi ambitions for world domination.

The directorate, management and staff of this group—fully employed in the Empire's essential war effort—regard this simple letter as a great inspirational message to pull together for our common cause and Mr. Oliver J. Nilsen, governing director of the group, has had it photographed for display throughout his whole Commonwealth organisation.

Further, Mr. Nilsen has requested us to endeavour to locate both Elsie and Una so



Where are the girls who wrote this letter?

that their employers can be advised of their courageous spirit. It is in this matter that you can be of inestimable help to us. The only information which we can give you to date is that the material with which the note was enclosed was Empire insulation tape. Your contributors or advertisers in this particular manufacturing field may be able to trace the writers.

We look forward to hearing from you in due course and trust that as the result of anything you may publish the originators of the letter in question will be traced.

NILCROM ELECTRICAL SALES (AUST.) PTY., LTD.
Melbourne. W. A. WADEY, *Manager*.

Education of Engineers

WITH reference to the article by Mr. G. W. Stubbings in the ELECTRICAL REVIEW of March 13th, I agree that the engineer tends to become too much of a specialist, and I am convinced that if he widens the scope of his interests to include such matters as literature, sociology and politics he must become more able in his profession, particularly if he has to handle men.

What is more, he should be a better citizen, and it seems to me that with the world in the state it is to-day, it behoves every thinking man and woman, whatever their walk in life, to apply themselves to the solution of the puzzle of recurring warfare and all its attendant evils. Prior to 1939, I must confess, I for one was content to leave politics to the professional politicians, but since we are now in our third year of world war, less than a quarter of a century after the end of the war which was going to end all wars, I, and no doubt millions of others, have been wondering how it could have happened all over again.

There is no doubt that the intense nationalistic outlook prevalent in the world up to 1939 had much to do with the subsequent catastrophe, but it has often been maintained that in the world of science and engineering national boundaries do not exist. Guests from other countries have always been welcome in our engineering institutions, and the World Power Conference had of necessity to be international.

After the war engineers will have a large part to play in helping to overcome misunderstandings between nations, and ultimately their active co-operation will be essential in the foundation of the world order which must one day come if civilisation is to survive.

Sanderstead, Surrey. D. E. GOUGH, B.Sc. (Eng.), A.M.I.E.E.

Short-Circuit Currents

MR. BEAVIS concludes his article on this subject in your issue of March 20th with a plea for the close attention of switchgear manufacturers to the needs of the cable side of electrical installations and for a greater degree of co-operation between the switchgear and cable industry.

This is excellent, but I think Mr. Beavis has missed a more important point, namely, that a plea should be addressed to the user that his attention be directed towards an appreciation of the limitations of cables under short-circuit conditions. I think that the majority of switchgear manufacturers have appreciated the points at issue for some time, and have, on many occasions, drawn the attention of other parties to unsound selection of cable sizes in relation to short-circuit values.

It is my experience that in many cases the switchgear maker has little opportunity to really assist. He is simply asked to supply switchgear of a certain breaking capacity and with the user's choice of protective gear. He gets little opportunity in so many cases to offer his advice on this choice and nearly always has to assume that the user has correctly calculated the requisite breaking capacity.

Worst of all, numerous cases occur where

the switchgear maker is not even told the size of cable to be used but is asked to supply a universal gland which can be used to suit some choice of cable to be made later.

Mr. Beavis rightly draws attention to the long times which occur on certain circuit-breakers due to relay timings. Here again this often arises due to the choice of protective gear and the switchgear maker finds himself unable to co-operate because he is not informed fully of the conditions or of the network as a whole.

Therefore, I would urge that it is towards the user that Mr. Beavis should direct his plea rather than to the switchgear maker. In addition, might I suggest that the time is really appropriate for some authoritative data on the ability of cables to withstand short-circuits to be published?

Egham, Surrey. R. T. LYTHALL.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE retirement of **Mr. M. Cable,** M.I.E.E., A.M.I.Mech.E., from the position of general manager of the Tramway and Electricity Departments of the Wellington City Corporation was recently announced.

Mr. Cable was born in Dunedin and was educated at the Union Street and Norman Schools, Dunedin, and University College, London. He was apprenticed in marine and mining engineering at Port Chalmers and was engaged for some years on the installation of gold mining plants in Otago. He returned to England where he continued his training at Siemens Bros., Woolwich, working there from 1899 to 1902. He was then appointed assistant engineer to the Brompton & Kensington Electricity Supply Co. and in 1904 became assistant engineer and manager of the Tramways Department of Reading Corporation.

He went back to New Zealand in 1907 to take up the appointment of assistant electrical engineer to the Wellington Corporation and has been general manager of the Tramway and Electricity Departments since 1924.

Mr. Cable has been succeeded as general manager by **Mr. L. B. Hutton,** M.C., M.I.E.E., assistant general manager. Mr. Hutton was born in Auckland in 1889. He was educated at the Canterbury University College School of Engineering and took the B.E. (Elec.) degree. Subsequently he held posts with the Public Works Department and the Southland Electric Power Board. During 1914–1919 he served in Egypt, Gallipoli and France.

Mr. G. W. Giffin, cable works manager to Siemens Bros. & Co., Ltd., has been appointed works manager in which position he will be responsible for all production and service departments throughout the whole of the Woolwich works and the company's dispersal factories.

Many of our readers will be glad to hear that **Lieut.-Col. A. E. Knights,** who is in the Far East, is safe and well. Col. Knights was in civil life manager of the Bury St. Edmunds electricity undertaking.

Mr. R. H. Friend, A.M.I.E.E., has been elected a director of Siemens-Schuckert (Great Britain), Ltd.

Mr. A. C. Baker, M.I.A.E., A.M.I.E.E., M.Inst.T., general manager of the Birmingham Transport Department has been nominated as president of the Municipal Passenger Transport Association for 1942-43.

Portsmouth Passenger Transport Committee has recommended the appointment of **Mr. D. P. Martin,** assistant engineer of the Nottingham Corporation Transport Department, as chief assistant engineer at a salary of £390 per annum, rising to £435 per annum.

Thornton-Cleveleys District Council has decided to extend the services of **Mr. A. G. Cooper,** electrical engineer, to March 31st, 1943.

Obituary

Mr. Alexander Dow.—We regret to report that Mr. Alexander Dow, the distinguished American electrical engineer, died on March 22nd. Mr. Dow was born in Glasgow in 1862 and left school before he was twelve, continuing his education at evening classes. He emigrated to the United States as a young man and from 1893 to 1896 was concerned with the design and construction of the first public lighting plant in Detroit, Michigan. In the latter year he became vice-president and general manager of the undertaking; since 1912 he had been president of the Detroit Edison Co. and its predecessors.

Mr. Dow was honoured by a number of American universities and he was well known on this side of the Atlantic, being a member of the I.E.E. and an honorary life member of the Institution of Mechanical Engineers. He gave evidence before the McGowan Committee on the Distribution of Electricity in 1936.

Mr. P. K. Turner.—We learn with regret of the death on March 16th of Mr. Philip Keston Turner at the age of fifty-three. Mr. Turner was a prominent figure in the radio world. During the last war he served with the R.F.C. and was later for a time editor of *Experimental Wireless*. He had been chief of research to the Burndept Wireless Co. and Graham Amplion, Ltd., and was more recently in the research department of Marconi's Wireless Telegraph Co. He was a member of the I.E.E. and was actively interested in the Wireless Section.

Mr. L. Wray.—The death occurred on March 14th, at the age of eighty-nine, of Mr. Leonard Wray, who spent the greater part of his life in the Malayan Civil Service. He became a member of the Society of Telegraph Engineers (now the I.E.E.) in 1876, when he exhibited to the Society a telephone which he had invented. Apart from his ordinary activities he was interested in X-ray work and had acted as honorary radiographer to various hospitals.

COMMERCE and INDUSTRY

Cable Makers' Wages. Radio Industry Planning.

Arbitration Award

THE Joint Industrial Council for the Cable Making Industry announces that under an Arbitration Award (Doc. J.I. No. 1,495) the Negotiating Committee has now fixed the amounts to be paid to girls (14–17 years of age inclusive) in Districts Nos. 1 and 2, and also to youths (14–20 years of age inclusive) in District No. 2. With regard to the rates for male juveniles in District No. 2, these are now the same as the rates in District No. 1, and therefore Schedule B for youths and boys in District No. 2 is cancelled and replaced by Schedule B in District No. 1.

The wages payable in the cable-making industry on the first payday after March 7th in respect of the period covered by that payday are as follows:—Male timeworkers (21 years of age and over): Varying from 68s. 6½d. to 76s. 4½d. in District No. 1, and from 65s. 6d. to 73s. 6d. in District No. 2. Youths and boys (under 21 years of age; timeworkers), Districts Nos. 1 and 2: Varying from 18s. 1½d. for boys 14 years of age, to 56s. 3½d. for youths of 20 years of age. Female timeworkers, Districts Nos. 1 and 2: From 19s. 9d. for girls 14 years of age to 24s. 3d. for girls 17 years of age, plus service bonus. Women 18 years of age and over: From 35s. 6d. to 39s. 6d. plus 3s. service bonus and 4s. 6d. award.

Ealing's British Restaurant

Miss Evelyn Laye, the actress, opened the second of a projected series of seven British (Civic) Restaurants at Ealing on March 11th. The restaurant is situated at the Mall, and the large gathering at the opening ceremony was presided over by Alderman Woodward, chairman of the Electricity, Civic Restaurants, and School Canteens Committees of the Council. The Mayor, Councillor C. D. Grant, J.P., was present, as were also the Mayors of Brentford and Chiswick, Wembley, Heston and Isleworth, and Tottenham.

The electric kitchen at an Ealing British Restaurant

The restaurant is electrically heated, with thermostatic control, and the large double oven range and other chief items of cooking equipment are electric. The Corporation Electricity Department was responsible for the electrical installation under the supervision of Mr. R. Birt, chief electrical engineer and manager.

Service With Home Guard

In January the town clerk of Darlington reported that under the new conditions of service in the Home Guard members would be unable to resign, and that if employees of the gas, electricity and water undertakings who were in the Home Guard accepted these conditions the undertakings might be seriously affected. It was therefore decided to request members to resign pending further information. Intimation has since been received that essential workers in such public utilities will not normally be mustered from their work, and the Council has accordingly asked employees concerned to withdraw their resignations.

Valve Price Prosecutions

At Glasgow Sheriff Court on March 13th, a fine of £5 was imposed on Young's (Glasgow), Ltd., who admitted selling a radio valve for 14s. 2d., which was 5s. in excess of the permitted price. An agent explained that the firm sold a variety of valves, and that in the case before the court a mistake in price had been made.

For failing to comply with the Price Controlled Goods (Invoice) Order and for selling a valve at more than the permitted price, Erica Dubois, a radio repairer, was fined £5 on each summons at Romford recently and ordered to pay five guineas costs. It was alleged that Dubois had failed to notify the local Price Regulation Committee that a seller of price-controlled goods had not provided an invoice, and had sold a valve at a gross profit of 14s. as against the permitted profit of 3s. 2d.

Radio Component Manufacturers

The annual report of the Council of the Radio Component Manufacturers' Federation which was to be submitted to the Federation's annual general meeting in London yesterday (Thursday) refers to the changes which the industry has undergone during the past year. These have also affected the functions of the Federation, and the Council has considered that its most useful service at the present time is to speak for component manufacturers to the Government officials concerned. At the inception of the

Components Control by the Ministry of Aircraft Production the Council urged the desirability of co-ordination in design with a view to avoiding unnecessary multiplications of types and offered to assist in the planning of increased production by ascertaining to what extent surplus productive capacity existed among the members of the Federation. Subsequently the Inter-Services (Communications) Components Committee was formed to co-ordinate and plan production, and arising out of a meeting which the Council was invited to attend, Panels were set up by the Federation to deal with problems in the manufacture of specific types of components. Membership of these Panels is not confined to members of the Federation; several are now in active operation and have made recommendations.

Factory Lighting Installation

The results which can be obtained by adequate and efficient lighting are shown in the accompanying illustration of one of the bays of the factory of British Auxiliaries, Ltd. The original average illumination was 2.5 ft.-candles and the present is 12 ft.-candles. The installation covers three bays of the factory which are permanently blacked out. The lighting is provided by ninety-two 1,000-W gasfilled, "Cosmos" lamps mounted on the roof trusses at a height of 30 ft. Arrangements have also been made for pilot lighting. The installation was designed by Metropolitan-Vickers Electrical Co., Ltd., who also supplied the lamps and fittings.

An example of efficient factory lighting at the works of British Auxiliaries, Ltd.

Chief Engineers' Salaries

By eleven votes to four Walton and Weybridge Urban District Council recently approved the action of its Finance Committee in rejecting a proposal of the Electricity Committee that the electrical engineer and manager (Mr. D. C. Thomson) should be granted an additional increment of £50 a year from April 1st next, and informing him that in the event of his deciding to apply for other appointments the Council would not insist upon the strict application of the Essential Work (General Provisions) Order. The chairman of the Council explained that Mr. Thomson did not ask for an increase; he produced a scale that would take effect in the district, and naturally contended that he should be put on the scale or, if not, that he should be allowed to go.

There was a further debate on the subject of chief electrical engineers' salaries at the March meeting of the Woolwich Borough Council when a report by the Town Clerk on the agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers for the Electricity Supply Industry, which was called for at the time of the appointment of a new electrical engineer last year, was considered. Councillor Newman, moving the adoption of the report, reviewed the circumstances of the appointment. He commented that it was because the number of people who could fill these higher-paid posts was so small that they were in a bargaining position, and that was why the salaries were too high compared with the reward of people in other positions whose bargaining powers were not so great. When there came to be equal educational facilities for all the disparity between high salaries on the one hand and wages on the other would decrease—he did not suggest that they would be equal.

Alderman Halse did not think the salary was too big for the job. The criticisms last November were, he felt, not aimed at the question of salary but the method by which it was arrived at. In the report it was stated that the chairman objected to the scale in principle because it "based a salary upon output for one officer only."

After Councillor Newman had said that they had a borough electrical engineer whom they all agreed was a good man, the report was formally adopted.

At a meeting of Stockton-on-Tees Town Council the Town Clerk reported on the National Joint Committee's agreement regarding the salaries of chief electrical engineers. He stated that it had been intended to call a conference of local authorities in the North-East on this matter, but this had not yet been done. He mentioned, however, that the question had been referred to a sub-committee by the Association of Municipal Corporations.

Royal Visit to Domestic Science Centre

Miss C. Haslett, C.B.E., Adviser to the Ministry of Labour on women's training, recently escorted Queen Mary on a tour of

inspection of a domestic science centre in the West Country, where canteen cooks are being trained under the Ministry's new scheme. Her Majesty showed great interest in the scheme. She had previously visited a Government Training Centre where men and women are receiving engineering training.

Plastics Year Book

The 1942 edition of "The British Plastics Year Book," which has just been published, once again contains a great deal of information of value not only to those engaged in the industry, but also to those who are looking to plastic materials for future development after the war. There are sections giving proprietary names, materials, manufacturers of plant and equipment used in the plastics industry, manufactured products, associations, etc., and Who's Who in the plastics industry, and technical data. The handbook is published by Plastics Press, Ltd., Sidney Road, Bedford, and 19-23, Ludgate Hill, London, E.C.4, at 15s. net.

Training Women Supervisors

The Ministry of Labour and National Service, in conjunction with the Board of Education and the Scottish Education Department, is organising courses of lectures at technical colleges throughout the country on the work of women supervisors. The establishment of a course in any particular locality will be dependent upon there being sufficient local demand. The lectures will cover general principles of workshop supervision; factory organisation; method of timekeeping and payment; elementary workshop practice; and factory legislation (including special wartime measures). The courses will normally be of thirty hours duration and classes will be held outside working hours at meetings usually lasting two hours. No allowances or expenses will be paid by the Ministry to students, but they will not be charged any fees.

Names and addresses of women applying for the course should be sent to the local Employment Exchange, with a reference to the scheme and with full details of experience and present employment. Women who have applied will be notified when the number of applications justifies the establishment of a course at a technical college in their locality. An examination will be held at the end of each course.

Distribution of Catalogues

As many readers are uncertain of the position with regard to the distribution of publicity matter it may be helpful to them to be acquainted with the relevant part of the Control of Paper Order (No. 36) which governs the situation. It is provided in this that no person shall in the United Kingdom (*a*) gratuitously distribute or cause to be so distributed any advertising circular relating to the sale of any goods or to any profession, trade or business, unless that circular was printed or made before the coming into force of the Order (November 12th, 1941); or (*b*) in any period of three consecutive calendar months after March 31st, 1941, gratuitously distribute or cause to be distributed advertising circulars the aggregate weight of which exceeds three-twentieths of the aggregate weight of advertising circulars of the same description distributed in the United Kingdom in the corresponding three months of the year ended August 31st, 1939.

This does not prevent the gratuitous distribution of trade catalogues dispatched to wholesalers or retailers of the goods advertised therein. An "advertising circular" is defined as "anything composed of or containing paper and distributed in substantially identical form to more than twelve persons for purposes of advertising, but shall be deemed not to include any diary containing advertising matter on not more than eight pages thereof."

Change of Address

Hydran Products, Ltd., have moved their offices to Station Approach, Shepperton, Middlesex (telephone: Walton-on-Thames 2322).

TRADE MARK APPLICATIONS

AMONG the recent applications for British trade marks are the following, objections against which may be entered within a month of the date shown:—

March 11th

DCO. No. 616746, Class 9. Electrodes for electric welding, not of precious metals.—Arthur Lind Annesley West, 69-71, Wolseley Street, Glasgow, C.5.

VIKING. No. 616840, Class 9. Electrodes for electric welding.—The Quasi-Arc Co., Ltd., Grosvenor House, Park Lane, London, W.1.

PHILITEX. No. 614983, Class 10. Devices and apparel for protection against X-rays.—Philips Lamps, Ltd., Century House, Shaftesbury Avenue, London, W.C.2. To be associated with No. 566554 (3034), viii.

PIRA. No. 617340, Class 10. Electro-medical appliances.—Perihel, Ltd., 12, Queen Street, London, E.C.3.

March 18th

STEWART-WARNER. No. 602849, Class 9. Ammeters and gauges for motor vehicles; speedometers, radio receiving sets and radiogramophones.—Stewart-Warner Cpn., Chicago. Address for service, c/o Lockett Hughes, 46, Bedford Row, London, W.C.1.

TELCOVIN. No. 617346, Class 17. Gutta-percha, india-rubber balata and synthetic rubber, and articles (not included in other classes) made from these substances.—Telegraph Construction & Maintenance Co., Ltd., "Blackstone," Redhill, Surrey.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

CRESTOLOY tools.
STELLITE tramway type controller.
Cooking Equipments Ltd.

ELECTRICITY SUPPLY

Fuel Problem at Belfast. Mid-Lancs. Board Inquiry

Belfast.—FURNACE ALTERATIONS.—Because of the use of Welsh coal the Electricity Department has had to incur an additional expenditure of £23,000 in alterations to the furnaces at the power station, which are designed to burn Ayrshire coal. An official of the Department, in an interview, stated that Welsh steam coal was very good, but the kind they were getting now was not so efficient. Dr. Little, M.P., is to raise the question again at Westminster.

Billingham-on-Tees.—SCHOOL SHELTER COMPLAINT.—A further request by the Urban District Council to Durham County Education Committee that electric heating and lighting should be provided in school shelters has been rejected, and the Council has decided to draw the attention of the Minister of Health to the detrimental effect on children's health through using the shelters in their present condition.

Bristol.—LOAN APPLICATION.—The Electricity Committee is seeking sanction to borrow £60,000 for fire precautions.

Cheshire.—SUPPLY EXTENSIONS.—The County Council has granted the following applications: H.v. extensions in the parishes of Chorlton, Croughton and Wervin for Chester Corporation; overhead service and overhead line for the Mid-Cheshire Electricity Supply Co., Ltd.; and extensions to Poynton for Macclesfield Corporation.

Hamilton.—BULK SUPPLY CONCESSION.—The Town Council at its last meeting approved an agreement with the Clyde Valley Electrical Power Co. regarding the amount to be charged for bulk supply of electricity for 1939-40 and 1940-41. The manager of the company stated that he was prepared to recommend his directors to agree to a 14 per cent. deduction from the charge. Under this settlement the Council would retain approximately £7,000 of the £7,500 deducted by the burgh engineer pending adjustment.

Inverness-shire.—WATER-POWER POLICY.—At a recent meeting of the County Council a resolution was passed in which the Council expressed the view that while it preferred the development of the water-power resources of the Highlands to be under public control it was prepared to give due consideration to proposals by companies which conformed with the principles laid down by the Council in 1936.

Mid-Lancashire.—PUBLIC INQUIRY.—The Electricity Commissioners held a public inquiry on March 19th at Preston to consider evidence against the disbanding of the Mid-Lancashire Electricity Advisory Board. Mr. C. E. Allen presided. Representations opposing the Order were received from several municipalities, including Burnley, Bacup, Clitheroe, Haslingden, Darwen, Fleetwood, Accrington and Rawtenstall. Mr. A. Glen, town clerk of Burnley, challenged the legality of the inquiry, and said that the Commissioners were proposing to act in excess of their judicial authority. They had no authority to say the powers of the Board should cease, and were proposing to take steps which would virtually turn the Board into a caucus which in time would become a nuisance. Mr. R. E. Nutter, town clerk of Preston, said that most constituent authorities thought the Board was redundant. Mr. A. S. Broughton, deputy town clerk of Blackburn, stated that Blackburn had long pressed for the disestablishment of the Board, which, they considered, had performed no useful function.

Mr. Glen, after criticising attempts since 1930 to get the Board to "commit suicide," contended that the third year of the war was not a proper time to bring the matter to a head. Consideration should be deferred until after hostilities. The inspector said he would report to the Commissioners.

Moray.—PROVISION FOR DEVELOPMENT.—Early this year Aberdeen County Finance Committee decided to confer with other counties in North-east Scotland on electrical development in view of the fact that the Grampian Electricity Supply Co. had reached a stage at which it was difficult to give the county extra power. Last week Moray County Council agreed to support Aberdeenshire in seeking to be free from the present restrictions of the Grampian Co., and urging that, unless the electricity necessary for the development of the area's resources was supplied, they should be allowed either to generate for themselves or to link up with other authorities. A committee was appointed to keep in touch with Aberdeen County Council.

Newcastle.—THE RATIONING PROPOSAL.—Commenting on the proposed rationing of electricity Lieut.-Col. E. H. E. Woodward, general manager of the North-Eastern Electric Supply Co., Ltd., said they had no idea how the plan would work. He pointed out that living conditions had altered greatly since December, 1939, when rationing of electricity was first proposed. It would be necessary, however, for households and business premises to use less electricity in order that supplies for factories could be maintained.

Perth.—INCREASE IN POWER CHARGES PROPOSED.—At a recent meeting of the Electricity Committee it was recommended that certain increases should be made in the charges for power during the financial year beginning on May 15th. The increases, which, it is understood, will apply to the large industrial consumers, are subject to the approval of the Electricity Commissioners.

Overseas

Portugal.—RATIONING IN LISBON.—A *Reuter* message from Lisbon states that from April 1st the supply of electricity in Lisbon is to be limited. Street and other public illuminations will be reduced by 30 per cent. There will also be a 20 per cent. reduction in the supply of electricity to private houses, ships and offices. Theatres and cinemas will have to restrict their intervals and electric signs will be banned.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

British Insulated Cables, Ltd., is holding its annual meeting on April 1st. A statement by the chairman, Sir Alexander Roger, was circulated with the report and accounts for 1941. In this, Sir Alexander says that there is criticism in the country that manufacturers and machines are not working to the limit, and if this is so he wonders whether it is owing to apprehension about post-war conditions. Personally, his interest lies at present in current problems, and not in post-war plans, but the latter cannot be ignored altogether and boards, managements and workers would be lacking in their duty if they did not pay some regard to the problem. There may be instances where some hesitation has been and still is being displayed by managements to shoulder financial responsibility for extensions which, while urgently essential for the war, cannot be described as ordinary financial or trading risks. On the other hand, he knew of numerous cases where these risks have already been taken with the result that substantial increase in production has been achieved. Further impetus might be given to production by an inspiring statement from the Government containing a promise that when victory is won there will be waiting a " fair deal " not only for labour but also for the investing public. Production must be encouraged by every legitimate means and nothing that ought to be said and can be said to promote production should be left unsaid. The utmost confidence between the Government, industrialists and labour was never more urgently required than at the present time.

The British Thomson-Houston Co., Ltd.—Presiding at the annual meeting on Friday last Mr. W. C. Lusk (chairman) referred to the retirement of Mr. F. Fraser, who had been secretary for forty years and a director for twenty-seven. After reviewing the accounts he said that the company's plant had been well maintained during the year and they had again provided for liberal depreciation. Mr. Lusk made special reference to the company's suggestion scheme in which the employees had shown an increased interest. A comprehensive scheme for the training of women had been inaugurated early in 1940 and it had proved very successful. While he could not say anything about the company's various activities, he was able to report that all the factories had been fully employed throughout the year and they were doing their utmost to increase production.

The Midland Counties Electric Supply Co., Ltd., held its annual meeting on March 18th when Mr. W. Shearer (chairman), who presided, said that the past year had been another of successful operation, despite the many difficulties which had had to be met and overcome by the management, functioning as it was with so many employees and members of the staff absent on service with the Forces. During the year it was found possible to reduce certain of the electricity tariffs and these were constantly under review, their desire being to effect reductions whenever practicable. When considering the results achieved by their electricity undertakings, it was well to bear in mind that the area throughout which they afforded direct supplies extended over 2,390 sq. miles, much of it being of a rural character. The normal programme of development had naturally been restricted during the past few years, but without detriment to the war effort the task continued and it had been possible to introduce supplies to six further parishes.

There had been a moderate increase in the number of consumers and in the total load connected to the system. A further move towards standardisation in the charges to industrial consumers whose tariff fell to be adjusted in relation to coal prices was introduced during the year. As from January 1st, 1942, the smaller domestic user was obtaining a reduction in the scale of charges for supplies given through slot meters and a new tariff had been instituted for the small power consumer. As a further measure of standardisation they had decided that every domestic consumer should have one meter supplied, fixed and maintained, without charge. The mileage run by the transport companies' vehicles was 8.5 million miles and the passengers carried numbered 53.7 millions.

Scottish Power Co.—In his address at the annual meeting of the Company on March 20th, Mr. W. Shearer (chairman) referred to the rejection, by consent, of the Glen Affric scheme, and said that as a Committee under the chairmanship of the Lord Justice Clerk was now sitting to consider water-power development in Scotland the matter must be regarded as *sub judice*. He remarked, however, that nearly half a century had elapsed since the late Lord Kelvin forecast the benefits which would accrue to the Highlands from the utilisation of one of its chief natural resources, and in that time only three major developments had been carried out —two by the British Aluminium Co. and the third by the Grampian Co. Replying to criticism of holding companies, he asserted that in the absence of this type of financial structure the development of many large areas could never have been undertaken successfully except with special legislation involving Government subsidies.

The British Aluminium Co., Ltd., reports that after making provision for taxation and debenture service, and setting aside £50,000 for depreciation and £100,000 for reserve, the net profit for 1941 is £417,332, as compared with £408,156 for 1940, to which is added £194,796 brought in. The final ordinary dividend is 7 per cent., again making 10 per cent., less tax, for the year, and the balance carried forward is £222,128.

The Singapore Traction Co. reports that the profit for the year to September 30th last, subject to taxation, was £115,937, as compared with £96,236 for 1939–40, plus £34,470 brought in, subject to E.P.T. Debenture sinking fund requires £3,210, depreciation and renewals £25,000, income tax £32,000 and E.P.T. £47,000. The ordinary dividend for the year is 2½ per cent., against 7½ per cent. and the balance carried forward, subject to taxation, is £26,656. In the

statement by the chairman, which will be submitted to the annual meeting on April 2nd, it is reported that a formal letter has been sent to the Secretary of State for Colonies asserting that the company would claim for all losses resulting from the war. Instructions were given some time ago that all surplus funds should be remitted to London with the result that when the Japanese occupation took place the company had only a negligible amount of cash in Singapore.

Associated Electrical Industries, Ltd.—After meeting taxation and depreciation the net earnings for 1941 were £418,240 (against £455,512 for 1940). As reported last week, the dividend is maintained at 10 per cent; £100,000 is transferred to dividend equalisation fund and £285,314 is carried forward.

The Midland Electric Manufacturing Co., Ltd., earned a net profit of £42,022 (after meeting taxation), as compared with £45,441 in 1940. The ordinary distribution (as already stated) is again 25 per cent. and £20,000 is again placed to general reserve.

Ericsson Telephones, Ltd., announces a trading profit of £308,881 (against £304,033 for 1940) and a net profit of £103,851 (against £129,788) after providing for taxation, etc. As already reported, the ordinary dividend is maintained at 17 per cent. free of tax, but the bonus is reduced from 5 to 3 per cent. The liquidation of British Automatic Totalisator, Ltd., has provided a surplus of £18,308, which has been devoted to writing down investments and to contingency account.

The National Gas & Oil Engine Co., Ltd., reports a profit for 1941, after providing for depreciation, taxation and war damage contribution, and including income from investments, of £49,402 (against £64,548 for 1940 before deducting £15,500 tax and A.R.P.). The ordinary dividend for the year is maintained at 5 per cent., less tax, general reserve receives £10,000 and £24,353 is carried forward (against £27,951 brought in).

Hoover, Ltd., in their report for 1941 show a trading profit of £274,480, as compared with £290,486 in the preceding year. Income tax and N.D.C. require £175,000 and contingency reserve £20,000. As already announced, the ordinary dividend for the year is maintained at 15 per cent. The balance carried forward is £24,614 (against £22,253 brought in).

Thomas De La Rue & Co., Ltd., state that recent happenings in Rangoon where their Far Eastern factory is situated will render it impossible to hold the general meeting next month, as had been intended. The company hopes to be in a position to issue its accounts in time to enable a meeting to be held in May

Enfield Cable Works, Ltd., reports a net profit for 1941 of £217,039, as compared with £224,215 in the preceding year, which was struck after depreciation, but before making a reserve of £55,000 for tax and N.D.C. The final ordinary dividend is 6¼ per cent., again making 12½ per cent. less tax, for the year.

Waste Heat & Gas Electrical Generating Stations, Ltd., reports a profit for the year ended January 31st of £8,604, as compared with £11,355 in the preceding year, to which is added £18,953 brought in. As already announced, the ordinary dividend for the year is maintained at 8 per cent. and £19,499 is carried forward.

Lisbon Electric Tramways, Ltd., intends to redeem all its outstanding 5 per cent. mortgage debentures on September 30th, 1942, at 110 per cent. The half year's interest due on July 1st will be paid as usual, and the final payment of interest from July 1st to September 30th will be paid on the latter date.

The Hoffman Manufacturing Co., Ltd., reports a net profit of £207,555 for 1941 (against £237,775). The allocations again include £50,000 to general reserve and £10,000 to pensions fund and the dividend is maintained at 17½ per cent., free of tax.

International Combustion, Ltd., earned a profit (before meeting taxation) of £197,769 for 1940–41, against £198,677. The taxation reserve again receives £75,000 and the dividend is maintained at 30 per cent. by a final distribution of 25 per cent. (including 10 per cent. bonus).

The Telephone & General Trust, Ltd., has declared a final dividend of 5 per cent. on the ordinary shares, again making 8 per cent. for the year, and a dividend of 8 per cent. (same) on the "A" ordinary shares. The net profit, before taxation, was reduced from £114,287 to £107,962.

The Telegraph Construction & Maintenance Co., Ltd., reports a profit for 1941 of £50,825, as compared with £47,569. The final dividend is 5 per cent., again making 10 per cent., less tax, for the year.

Brown Bros., Ltd., are maintaining their dividend at 12½ per cent. by a final payment of 10 per cent., from a net profit of £96,245 (against £112,360).

The Yorktown (Camberley) and District Gas & Electricity Co., is paying a final dividend of 3¼ per cent. (against 2¾ per cent.), making 5⅞ per cent. for the year (against 5½ per cent.).

Heenan & Froude, Ltd., are again paying an interim dividend of 5 per cent.

A. C. Cossor, Ltd., have declared an interim dividend of 5 per cent. (unchanged).

Worthington-Simpson, Ltd., have again declared a dividend of 7 per cent. for the past year.

The Shawinigan Water & Power Co. is again paying a quarterly dividend of 22 cents.

New Companies

B. & C. Electrical, Ltd.—Private company. Registered March 4th. Capital, £500. Objects: To acquire the business of electrical contractors and wireless engineers carried on by A. E. Chaffe at 6, Pine View Gardens, Torquay; also to carry on the business of manufacturers of, and dealers in, electric accumulators and batteries, insulating materials, wireless accessories, etc. Directors: A. Bune, 20, Grange Road Torquay, and A. E. Chaffe, 6, Pine View Gardens, Torquay. Registered office: 6, Pine View Gardens, Torquay, Devon.

T. H. Dobie, Ltd.—Private company. Registered March 7th. Capital, £1,000. Objects: To carry on the business of manufacturers, repairers and hirers of and dealers in electrical and mechanical apparatus, in particular wireless

and television sets and valves, radio and other gramophones and records and musical instruments; manufacturers of and dealers in glass, china, earthenware, pottery, etc. Directors: Thos. Henry Dobie and Thos. Herbert Dobie, both of 68, Stramongate, Kendal. Registered office: 68, Stramongate, Kendal, Westmorland.

Rainbow Radio Manufacturing Co., Ltd.—Private company. Registered March 5th. Capital, £2,000. Objects: To carry on the business of manufacturers of and dealers in wireless, television and gramophone goods, electric lamps, radiators, fires, cookers, irons, vacuum cleaners, domestic appliances, dealers in cycles, motors, sports goods, etc. Directors: J. N. Anelay, 326, Preston Old Road, Blackburn, and F. H. Anelay, "Woodgrove," Knowsley Road, Wilpshire, Blackburn. Registered office: Chapel Street Works, Blackburn.

Southey & Wight, Ltd.—Private company. Registered March 5th. Capital, £1,000. Objects: To carry on the business of electrical, wireless, television, motor and general engineers, lighting specialists and contractors, consulting wireless experts, ironmongers, manufacturers of and dealers in gramophones, cycles, motor vehicles, refrigerators, etc., either for cash or on the deferred payment system. Directors: A. H. Southey and Florence Southey, both of Southwood Hall, Highgate, N.6. Registered office: Hill Top, Muswell Hill, N.10.

Companies' Returns

Statements of Capital

Milton & Barton-on-Sea (Hants) Electricity Supply Co., Ltd.—Capital, £25,000 in 5,000 7 per cent. cumulative preference and 20,000 ordinary shares of £1 each. Return dated April 18th (filed October 11th). All shares taken up. £24,227 paid on 5,000 preference and 19,227 ordinary shares. £773 considered as paid on 773 ordinary shares. Mortgages and charges: Nil.

Cawnpore Electric Supply Corporation, Ltd.—Capital, £547,986 in 200,000 preference and 347,986 ordinary shares of £1. Return dated August 28th (filed October 28th). 200,000 preference and 318,500 ordinary shares taken up. £443,500 paid on 200,000 preference and 243,500 ordinary shares. £75,000 considered as paid on 75,000 ordinary shares. Mortgages and charges: £288,000.

Collier Electric, Ltd.—Capital, £100 in 100 shares of £1 each. Return dated December 31st, 1939 (filed January 8th, 1942). All shares taken up. £100 paid. Mortgages and charges: Nil.

Intensalite Signs & Fixtures Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 15th. All shares taken up. £1 000 paid. Mortgages and charges: Nil.

H. A. Lamb & Sons, Ltd.—Capital, £1,000 in £1 ordinary shares. Return dated January 2nd. All shares taken up. £615 paid. £385 considered as paid. Mortgages and charges: Nil.

Rotapex, Ltd.—Capital £5,000 in 5,000 ordinary shares of £1 each. Return dated November 6th. 101 shares taken up. £101 paid. Mortgages and charges: Nil.

Metallic Seamless Tube Co., Ltd.—Capital, £65,333 6s. 8d. in 20,000 preference shares of 13s. 4d. each and 260,000 ordinary shares of 4s. each. Return dated December 12th. 15,245 preference and 260,000 ordinary shares taken up. £36,163 6s. 8d. paid. £26,000 considered as paid. Mortgages and charges: Nil.

Mortgages and Charges

Insulation Equipments, Ltd.—Conveyance and mortgage, dated January 12th, 1942, charged on freehold land at Shady Lane, Old Oscott, Perry Barr, Birmingham (being property acquired by the company on January 12th, 1942). Amount owing: £1,250. Registered pursuant to Section 81 of the Companies Act, 1929. Mortgagee: Alfred G. Snell, Georgian House, Monmouth Drive, Sutton Coldfield. (Registered February 24th, 1942, by permission of the Court.)

English Electric Co., Ltd.—Satisfaction to the extent of £22,600 on November 15th, 1941, of 4 per cent. debenture stock, secured by trust deed dated May 7th, 1936, and registered May 12th. (Notice filed February 27th, 1942.)

Underwood (Electric) Ltd.—Assignment of proceeds of contracts, dated February 26th, 1942, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £200.

Ace Radio, Ltd.—Assignment of contract moneys, dated February 27th, 1942, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Winding-up Order

Whitehead Switchgear & Inventions, Ltd.—An order for the compulsory winding-up of this company was made by Mr. Justice Bennett on Monday last on a creditors' petition.

Bankruptcies

T. Maund, 37, Earle Road, Bramhall, lately carrying on business as electrical engineer at 80, Wellington Road North, Heaton Norris, Stockport, under the style of Beacon Electrical Co.—First and final dividend of 1s. 8¾d. in the £, payable April 8th at 20, Byrom Street, Manchester.

F. Johnson, electrical engineer, 115, Ullswater Crescent, Kingston Vale, Surrey, lately carrying on business or residing at 36, St. Phillips Avenue, Worcester Park, and 36, Westwood Road, Barnes, Surrey.—Receiving order made March 11th on a creditor's petition.

R. Jackson, electrician, 5, Romney Avenue, Dalton-in-Furness, lately carrying on business at 38, Whalley Range, Blackburn, Lancs.—Trustee, Mr. W. G. Pearson, 16, Cornwallis Street, Barrow-in-Furness, Official Receiver, released March 11th.

E. N. Belsten, electrical contractor, 245, Highters Heath Lane, Warstock, Birmingham.—Trustee, Mr. R. K. Clark, 37, Temple Street, Birmingham, Official Receiver, released March 11th.

A. Bremner (deceased), retired electrical engineer, "Bryneglwys," Newton, Porthcawl.—Trustee, Mr. R. Betts, 10, St. Mary's Square, Swansea, Official Receiver, released March 16th.

H. P. Stuckey, electrician, 9, King Street, Glastonbury, Somerset.—Receiving order made March 9th on debtor's own petition.

STOCKS AND SHARES

TUESDAY EVENING.

THIS week's target of £125 millions, at which London is aiming for its Warship Week, is an amount sufficiently spacious for it to affect, in theory, all Stock Exchange markets that are concerned with investment securities. It might have been supposed that the effort to raise this sum would bring in sellers desirous of exchanging their present holdings for one or other of the National War issues. If there is any realisation of this kind going on, the Stock Exchange markets have been singularly free from its repercussion, for prices of gilt-edged stocks hold their ground with firmness. Among the best class industrials, too, no such desire on the part of shareholders is apparent.

This makes convincing evidence of the abundance of capital that presumably has been awaiting Warship Week in order to take up war loans. Stocks such as those, for example, of the Central Electricity Board and the London Passenger Transport Board, have undergone no changes in price. In the equipment and manufacturing group, the alterations are of little significance. Cable and Wireless stocks, after a further break, partially recovered. Shares in Indian companies show no recovery from the weakness which attacked them upon Japan's capture of Java and invasion of Burma.

Net Yield on Money

This present week sees the release of something like £70 millions of money being paid over to holders of the Canadian securities that have been requisitioned by the Treasury. The greater part of the money will no doubt be reinvested in one or other of the Government's war borrowing channels, but a certain amount is sure to come into Stock Exchange markets for employment in securities that offer a better rate of interest on the money than is provided by the war issues. Taking 3 per cent. as the return afforded by the latter, investment looks for anything between 7 and 10 per cent. ; mixed with the War Loans, this will give an average yield on the money of 5 to 6½ per cent. Even the latter rate allows no more than 3¼ per cent. net, taking income tax at 10s. in the £.

Home Railways

With the Budget being opened soon after Easter, uncertainty is felt as to whether 10s. is likely to remain the "ceiling" of the income tax charge. Therefore, investment is turning practical attention to the yields offered by Home Railway stocks, from some of which a return of 10 per cent. is obtainable. While the junior Home Railway stocks are still none too popular, the senior varieties are attracting greater attention than they have done recently and prices are on the rise. Southern Railway 5 per cent. preference at 108½ continues its advance.

More Rationing

The threatened cut in electricity, gas and coal has aroused discussion as to the effect which this is likely to have upon the earnings of companies connected with the fuel and lighting industries. It has raised the question whether the electricity supply companies will be able to maintain their present rates of dividend, which, as our tables show, mostly stand on a level which investment has regarded for some time past as likely to retain its permanence. This is brought out by the prices at which shares of the leading companies stand. In the majority of cases, the current quotations permit of a yield of little more than 4¼ per cent., obviously a gilt-edged return, reflecting the confidence felt by proprietors of the shares, and the assumption that the dividends will be continued at their present rates. So far, the announced intention to restrict consumers in somewhat drastic fashion has had no quotable effect upon prices of shares in the Stock Exchange market.

Price Fluctuations

The fluctuations in the prices of Home electricity supply companies' shares include a rise of 1s. in Southern Areas and a similar fall in South London to 20s. 6d. and 26s. respectively. Richmond Electrics are a good market at 25s. ex dividend. Clyde Valley shares recovered the dividend deduction, remaining at 39s. 6d. Bournemouth & Poole at 55s. are also ex dividend. In the Overseas list, Victoria Falls have lost another ½, going back to 72s. 6d; it is officially denied, of course, that the United States desires to see curtailment of South African gold production in order that more man-power may be available for war work. Excellent figures characterise the British Insulated report and the price of the ordinary shares at 92s. 6d. is the same ex dividend as it was prior to the deduction. Tube Investments and General Electrics are ½ easier. Westinghouse Brake lost half-a-crown. Revival of interest in the shares of companies concerned with radio sets brought about a rise of 9d. in E.K. Cole shares to 10s. 9d., others in the same group being also harder. There is a little more interest being taken in rubber shares, with a corresponding modest improvement in prices.

Miscellaneous Matters

The Vickers accounts show a decrease in the profits for 1941 of £210,000—a decrease of 23 per cent. as compared with the previous twelvemonth. A final dividend of 6 per cent. is recommended, making 10 per cent. for 1941—the same as before. The price of the shares remains about 16s. 3d., at which the yield on

(*Concluded on page* 417)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Mar. 23	Rise or Fall	Yield p.c.
Home Electricity Companies					£ s. d.
Bournemouth and Poole	15	12½	55/-xd	..	4 11 0
British Power and Light	6	6	27/6xd	..	4 7 3
City of London ..	7	7	27/6	..	5 1 9*
Clyde Valley ..	8	8	39/6xd	+6d.	4 1 0
County of London ..	8	8	37/6	..	4 5 6
Edmundson's:					
7% Pref. ..	7	7	33/9	..	4 3 0
Ord.	6	6	28/6	..	4 4 3
Elec. Dis. Yorkshire	9	9	42/6	..	4 4 9
Elec. Fin. and Securities	12½	12½	46/3	..	5 8 2
Elec. Supply Corporation ..	11½	10	45/-	..	4 9 0
Isle of Thanet ..	2	Nil	10/-	..	—
Lancs. Light and Power	7½	7½	34/6	..	4 7 0
Llanelly Elec. ..	5½	5½	22/-	..	5 0 0
Lond. Assoc. Electric	4½	4	18/9	..	4 5 4
London Electric ..	6	6	25/9	..	5 13 3
London Power Red. Deb.	5	5	103½	..	4 16 7
Metropolitan E.S. ..	8	8	36/3xd	..	4 8 6
Midland Counties ..	8	8	38/9	..	4 2 0
Mid. Elec. Power ..	9	9	41/3	..	4 7 4
Newcastle Elec. ..	7	7	27/6	..	5 1 10
North Eastern Elec.:					
Ordinary ..	7	7	30/-xd	..	4 13 4
7% Pref. ..	7	7	33/6xd	..	4 3 7
Northampton ..	10	10	46/3	..	4 6 7
Notting Hill 6% Pref. (£10) ..	6	6	8½	..	—
Northmet Power:					
Ordinary ..	7	7	35/9xd	..	3 18 4
6% Pref. ..	6	6	32/-	+6d.	3 15 0
Richmond Elec. ..	6	6	25/-xd	+1/6	4 16 0
Scottish Power ..	8	8	38/3xd	..	4 3 9
Southern Areas ..	5	5	20/6	+1/-	4 17 7
South London ..	7	7	26/-	-1/-	5 7 8
West Devon ..	5	5	21/3	..	4 14 1
West Glos. ..	4½	4½	21/3	..	4 4 8
Yorkshire Elec. ..	8	8	39/6	..	4 1 0
Overseas Electricity Companies					
Atlas Elec. ..	Nil	Nil	4/-	..	—
Calcutta Elec. ..	8*	7*	20/-	..	—
Cawnpore Elec. ..	10	10	25/-	..	8 0 0
East African Power	7	7	27/-	..	5 3 8
Jerusalem Elec. ..	7	5	18/9	..	5 6 8
Kalgoorlie (10/-) ..	7½	7½	9/6	..	7 12 10
Madras Elec. ..	6*	4*	15/-	..	5 6 8
Montreal Power ..	1½	1½	23½	+½	6 7 8
Palestine Elec. "A"	Nil	Nil	18/9	..	—
Perak Hydro-elec. ..	6	7	5/-	..	—
Shawinigan Power	85cts.	90cts.	14½	..	—
Tokyo Elec. 6% ..	6	6	12½	..	—
Victoria Falls Power	15	15	72/6	-1/-	4 2 9
Whitehall Inv. Pref.	7½	7½	15/9xd	..	9 10 8

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Mar. 23	Rise or Fall	Yield p.c.
Public Boards					£ s. d.
Central Electricity:					
1950-70	5	5	110	..	4 11 1
1955-75	5	5	113	..	4 8 6
1951-73	4½	4½	109	..	4 2 7
1963-93	3½	3½	103	..	3 8 0
1974-94	3¼	3¼	99	..	3 5 8
London Elec. Trans. Ltd.	2½	2½	94	..	2 13 2
London & Home Counties 1955-75	4½	4½	110	..	4 1 10
Lond. Pass. Trans.:					
A	4½	4½	120½	..	3 11 8
B	5	5	119½	..	4 3 8
C	3	2⅞	39	..	7 7 5
West Midlands J.E.A. 1948-68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo.-Am. Tel.:					
Pref.	6	6	109½	+1	5 9 8
Def.	1½	1½	25	..	6 0 0
Anglo-Portuguese	8	8	15/-	..	10 15 4
Cable & Wireless:					
5½ Pref.	5½	5½	88½	-1½	6 4 3
Ord.	4	4	50	..	8 0 0
Canadian Marconi $1	Nil	4cts.	5/6	..	3 9 0
Globe Tel. & Tel.:					
Ord.	8½*	8½*	25/-	-⅛	—
Pref.	6	6	25/-	-⅛	4 16 0
Great Northern Tel.:					
(£10)	20	20	13½	-1	—
Inter Tel. & Tel. ..	Nil	Nil	3	..	—
Marconi-Marine ..	7½	7½	28/9	..	5 4 4
Oriental Tel. Ord. ..	11½*	16	47/6	..	6 14 9
Telephone Props. ..	6	6	10/-	..	12 0 0
Tele. Rentals (5/-)	10	10	9/-	..	5 11 1
Traction and Transport					
Anglo. Arg. Trans.:					
First Pref. (£5) ..	Nil	Nil	5/-	..	—
4% Inc.	Nil	Nil	9½	..	—
Brit. Elec. Traction:					
Def. Ord. ..	45	45	915	..	4 18 3
Pref. Ord. ..	8	8	170	..	4 14 2
Bristol Trams ..	8	10	45/-	..	4 9 0
Brazil Traction ..	$1	50c.	13½	..	—
Calcutta Trams ..	8	5½	12/6	..	8 16 0
Cape Elec. Trams. .	5	5	19/-	..	5 5 3
Lancs Transport ..	10	10	45/-	..	4 9 0
Mexican Light:					
1st Bonds ..	5	5	75½	..	6 12 5
Rio 5% Bonds ..	5	5	97½	..	5 4 8
Southern Rly.:					
5% Prefd. ..	5	5	63½	+1	7 17 6
5% Pref. ..	5	5	108½	+1	4 12 0
T. Tilling	10	10	48/9	..	4 2 2
Tilling & B.A. ..	7*	6½*	52/6	..	2 9 6
West Riding ..	10	10	39/-	..	5 2 7

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Mar. 23	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord. ..	Nil	7½	24/–	..	6 5 0
Assoc. Elec.:					
Ord.	10	10	45/–xd	..	4 9 0
Pref.	8	8	38/9	..	4 2 4
Automatic Tel. & El.	12½	12½	46/3xd	..	5 8 3
Babcock & Wilcox	11	11	45/9	..	5 0 6
British Aluminium	12½	10	43/9	–9d.	4 11 4
British Insul. Ord.	20	20	92/6xd	+1/6	4 6 6
British Thermostat (5/–)	18½	18½	13/9	..	6 14 6
British Vac. Cleaner (5/–)	12½	10	10/–	–1/–	5 0 0
Brush Ord. ..	Nil	Nil	4/6	..	—
Callender's ..	15	15	72/6	..	4 2 9
Chloride Elec. Storage	15	15	75/–	..	4 0 0
Cole, E. K. (5/–) ..	Nil	7	10/9	+9d.	3 5 2
Consolidated Signal	17	17	77/6	..	4 7 8
Crabtree (10/–) ..	17½	17½	29/6	..	5 18 8
Crompton Parkinson Ord. (5/–) ..	30	20	22/6	..	4 9 0
E.M.I. (10/–) ..	Nil	6	13/9	..	4 7 3
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	16½	12½	55/–	..	4 11 0
Elect. Switchgear (10/–)	16	10	20/–	..	5 0 0
English Electric ..	10	10	38/9	..	5 3 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–) ..	25*	22*	41/3	..	2 13 3
Ever Ready (5/–) ..	40	40	31/–	..	6 9 0
Falk Stadelmann ..	7	7½	22/–	..	6 16 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.E.C.:					
Pref.	6½	6½	33/9	..	3 17 2
Ord.	20	17½	81/3	–1/6	4 6 1
Greenwood & Batley	15	13	27/6	..	9 9 0
Hall Telephone (10/–)	15	10	16/3	..	6 3 1
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	21/3	..	4 4 8
Hopkinsons ..	15	15	47/–	..	6 7 10
India-Rubber Pref.	5½	5½	21/3xd	+3d.	5 3 6
Intl. Combustion ..	32½	30	107/6	..	5 11 6
Johnson & Phillips	15	15	60/–	+1/6	5 0 0
Lancashire Dynamo	20	20	66/3	..	6 0 10
Laurence, Scott (5/–)	15	15	11/–	..	6 16 4
London Elec. Wire	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	67/–	–6d.	4 9 9
Mather & Platt ..	10	10	39/6	..	5 1 3
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	87/6	..	4 11 4
Pye Deferred (5/–) ..	25	25	15/–	..	8 6 8
Revo (10/–) ..	5	20	25/7½	..	7 16 0
Reyrolle	12½	12½	57/6	..	4 7 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Smith, S. (1/–) ..	50	37½	7/–	..	5 7 2
Strand Elec. (5/–) ..	2	4	3/6	..	5 14 4
Switchgear & Cowans (5/–)	10	15	10/–	..	7 10 0
T.C.C. (10/–) ..	Nil	5	11/3	..	4 9 0
T.C. & M.	10	10	38/9	..	5 3 3
Telephone Mfg. (5/–)	9	9	9/–	..	5 0 0
Tube Investments	23½	20	82/–	–1/6	4 17 7
Vactric (5/–) ..	4	Nil	5/–	..	—
Vickers (10/–) ..	10	10	16/3	–3d.	6 3 1
Ward & Goldstone (5/–)	20	20	19/–	..	5 5 3
Westinghouse Brake	10	10	47/6	–½	4 4 2
Walsall Conduits (4/–)	55	55	32/6	..	6 15 4
West, Allen (5/–) ..	7½	7½	5/9	..	6 10 5

* Dividends are paid free of Income Tax.

Stocks & Shares (*Continued from page* 415)

the money comes to practically 6½ per cent., allowing for inclusion of the dividend in the price. Babcock & Wilcox are unchanged at 43s. 9d., at which, on the basis of the last paid 11 per cent. dividend, the return is sixpence over 5 per cent. on the money. Johnson & Phillips are a good market at 60s., there having been a certain amount of investment in the shares on the idea that the next accounts will make a favourable showing. The British Aluminium figures are good, the shares at 43s. 9d., showing £4 11s. 4d. per cent. on the money. The Telephone & General Trust's final dividend is 5 per cent. making 8 per cent. for the year, and the profits of £107,962 are about £6,500 down. The price of the ordinary shares is unchanged at 23s. 9d., the 7 per cent. preference being quoted at 26s. 3d. London Electric Wire 7½ preference are better at 31s. 3d.

Enemy Occupation

The Chancellor of the Exchequer is being asked to indicate what line the Government intends to take in connection with the liability to Excess Profits Tax of British companies operating in those territories in the Middle and Far East which have been occupied by the Japanese. The matter is of urgent importance to many companies which have been seriously affected by the enemy occupation. The Singapore Traction Co. holds its annual meeting on April 2nd; and, in the statement issued with the accounts, the chairman says that a formal letter has been sent to the Secretary of State for the Colonies to the effect that the company would claim for all losses resulting from war. The company's surplus had already been remitted to London; when the Japanese entered Singapore, only a negligible amount of cash had been left by the Singapore Traction Co. in the town. The chairman says that large sums are involved, and the company will shape its course in the light of the best advice obtainable. The price of the ordinary shares remains at a nominal 7s. 6d. for the £1 unit of stock and the 7 per cent. preference are quoted at about 12s. 6d. The last recorded bargain in the ordinary stock was at 18s. 6d. on October 23rd last, and 23s. in the preference stock on December 15th, 1941.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1940

1317. "Method of and means for reproducing a television picture with cathode-ray tube and separate light source." Ges. Zur Forderung der Forschung auf dem Gebiete der Technischen Physik an der Eidgenossischen Technischen Hochschule. November 8th, 1939. (543485.)

5935. "Starting arrangements for electric generators driven by internal combustion engines and associated with accumulators." F. Porsche. March 9th, 1939. (543486.)

7316. "Radio receiving sets." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). April 23rd, 1940. (Convention dated not granted.) (543387.)

7420. "Apparatus for controlling two or more electric vapour or gas discharge tubes." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). April 24th, 1940. (Convention date not granted.) (543456.)

7907. "High-frequency induction furnaces." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 2nd, 1940. (Convention date not granted.) (543422.)

8124. "Apparatus for precipitating metal by decomposition of a gaseous compound thereof." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 6th, 1940. (Convention date not granted.) (543457.)

8126. "Installations for conversation in both directions between two points." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 6th, 1940. (Convention date not granted.) (543388.)

10437. "Method for sterilisation by means of ultra-violet rays." D. S. Cronsioe and A. O. U. Gronvall. June 28th, 1939. (543460.)

10457. "Generator for producing a range of predetermined frequencies." Marconi's Wireless Telegraph Co., Ltd. June 16th, 1939. (543391.)

10725. "Automatic clutch or the like for electric motor or other prime mover." H. R. Morgan. July 21st, 1941. (543392.)

11999. "Electron-discharge apparatus." Standard Telephones & Cables, Ltd. October 6th, 1939. (543493.)

13225. "Electric contacts suitable for fuses." Siemens Bros. & Co., Ltd., and C. E. Rose. August 20th, 1940. (543429.)

13312. "Master-clock mechanism." S. Smith & Sons (Motor Accessories), Ltd., and V. J. S. Russell. August 21st, 1940. (543395.)

13319. "Valves for controlling the supply of fluid under pressure." Automatic Telephone & Electric Co., Ltd., and R. N. Saxby. August 22nd, 1940. (543396.)

13396. "Electron-discharge devices incorporating high-frequency resonators." Standard Telephones & Cables, Ltd., and C. N. Smyth. August 23rd, 1940. (543400.)

13497. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. H. Maggs. August 27th, 1940. (Addition to 392299.) (543536.)

13697. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. August 31st, 1939. (543522.)

14028. "Electron-discharge tubes." British Thomson-Houston Co., Ltd. September 9th, 1939. (543499.)

14054. "Manufacture of electron-discharge devices." Standard Telephones & Cables, Ltd. December 2nd, 1939. (543403.)

14224. "Spun-glass products." British Thomson-Houston Co., Ltd. September 16th, 1939. (543434.)

14228. "Electric valve converting apparatus." British Thomson-Houston Co., Ltd. September 16th, 1939. (543501.)

14686. "Radio receivers." Ferranti, Ltd., and G. I. Thomas. September 28th, 1940. (543503.)

14752. "Television transmitters." Marconi's Wireless Telegraph Co., Ltd. September 30th, 1939. (543474.)

14912. "Saw-tooth wave generator." Hazeltine Corporation. October 25th, 1939. (543504.)

15131. "Conversion of electric currents." T. Hamilton-Adams. October 10th, 1940. (543407.)

15579. "Systems for controlling a dynamo-electric machine tensioning a length of material." British Thomson-Houston Co., Ltd. October 28th, 1939. (543526.)

15648. "Electrolytic electric condensers." British Insulated Cables, Ltd., H. Higham, F. J. Brislee, L. C. Bannister and J. C. Quayle. October 24th, 1940. (543505.)

15942. "Thermostatic timing control devices." British Thomson-Houston Co., Ltd. October 31st, 1939. (543409.)

16441. "Electric motor-control systems." British Thomson-Houston Co., Ltd. November 15th, 1939. (543527.)

16984. "Remote control device for use with plug and socket connections for electric machinery such as conveyors and coal-cutting machines." H. Wood & Co., Ltd., and A. Hayes. November 27th, 1940. (543413.)

17007. "Alternating electric current induction-type watt-hour meters." G. Wall, G. McCallum and Metropolitan-Vickers Electrical Co., Ltd. November 28th, 1940. (543437.)

17161. "Sound recording amplifier circuits." Marconi's Wireless Telegraph Co., Ltd. December 1st, 1939. (543414.)

17564. "Electrical signalling systems using frequency modulation." General Electric Co., Ltd., and N. R. Bligh. December 11th, 1940. (543438.)

1941

301. "Coal-cutting machines." Mavor & Coulson, Ltd., and A. M. Munro. January 8th, 1941. (543440.)

315. "Glass compositions and seals for sodium vapour electric-discharge lamps made therewith." British Thomson-Houston Co., Ltd., and J. E. Stanworth. January 9th, 1941. (543441.)

500. "Water cooling towers." R. H. Harral and Davenport Engineering Co., Ltd. January 14th, 1941. (543444.)

2062. "Electric contact thermometers and the like." W. Crockatt & Sons, Ltd., and W. C. Crockatt. February 14th, 1941. (543531.)

2789. "Heat interchange apparatus." Serck Radiators, Ltd., and E. Garner." March 1st, 1941. (543446.)

3085. "Electric toasters." British Thomson-Houston Co., Ltd. March 6th, 1940. (543477.)

3169. "Welding." Linde Air Products Co. April 24th, 1940. (543447.)

3484. "Method and apparatus for electric welding." Linde Air Products Co. June 20th, 1940. (543532.)

4732. "Method of welding." Linde Air Products Co. May 29th, 1940. (543416.)

5193. "Circuit-controlling systems." Igranic Electric Co., Ltd. April 22nd, 1940. (543478.)

5809. "Tap-change switches for electric transformers and similar apparatus." Asea Electric, Ltd., and J. F. White. May 5th, 1941. (543479.)

Amended Specification

511093. "Electrical apparatus for distance measurements." Sperry Gyroscope Co., Inc.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parenthesis.

Australia.—SYDNEY COUNTY COUNCIL.—April 30th. Steam and feedwater piping for No. 10 turbo-alternator at Bunnerong (Specification 559; time extended from January 29th).

Bury.—March 30th. Town Council. Heating, hot water and electrical installations at the Youth Centre. Particulars from Mr. J. Chadwick, borough engineer, Bank Street.

Manchester.—April 7th. Electricity Department. One 500-kW, 6,600/210-V, AC (three-phase)/DC (two-wire) motor generator or motor convertor and starting equipment, and low-pressure pipework, supports, etc., together with one steel storage tank (March 20th).

Nottingham.—March 31st. City Water Department. Centrifugal borehole and booster pumps, complete with electric motors and switchgear. Specification and form of tender from B. W. Davies, engineer and manager, Water Department, Castle Boulevard.

South Africa.—DURBAN.—April 17th. City Council. 3,300-V switch cubicles. (Contract E.2045.)

May 15th. Turbo-generator sets, switchgear and Diesel-engined starting set. (Contract W.45/US.)

JOHANNESBURG.—April 9th. Railways and Harbours. DC generator sets. (Contract P.S. 6065.)

April 22nd. Portable electric lighting sets. (Contract 3586.) Tender time extended.

April 29th. Insulated wire. (Contract P.S. 6070.)

April 30th. Cable. (Contract P.S. 6071.)

PIETERMARITZBURG.—May 7th. City Council. Cables. (Contract 204); lamps (205); poles (206); fuse boxes (207); wire (208); switchgear (209); and transformers (210).

SALISBURY.—April 13th. City Council. Distribution materials. (Contract E.15.)

May 18th. Cable and conductors. (Contract E.17.)

BULAWAYO (S. RHODESIA).—May 20th. Municipality. Meter testing equipment. (Contract E.13 1942.)

KENHARDT.—June 24th. Municipality. Plant for electricity supply undertaking.

UPINGTON.—June 24th. Municipality. Electric plant (alternator, switch board, meters, crude oil engine, etc.).

Orders Placed

London.—ISLINGTON. Electricity Committee. Accepted for twelve months. L.v. cables.—Aberdare Cables; Britannic Electric Cables Co. Transformers.—British Electric Transformer Co., Ltd.; Lindley Thompson Transformer & Service Co.; Hackbridge Electric Construction Co. Transformer tanks.—Alfred Allen & Son. Cable, terminal service, network, fuse boxes, etc.—Callenders; W. Lucy & Co.; Aero Engines; Siemens Bros. & Co.; Henley's; A. C. Woodrow & Co.; John Every; Clay Cross Co.; Dussek Bitumen & Taroleum Co.; L. Andrew & Co. Electric lamps.—B.T.H. Co.; G.E.C.; Philips Lamps; Ensign Lamps. Electric wires and sundries.—Lighting, Heating & Traction Supplies Co.; Dacier. Meters.—Sangamo Weston; Metropolitan-Vickers; Aron Electricity Meter. Earthenware pipes, troughs, bricks, fireclay, etc.—Cable Covers; John G. Stein & Co.; J. H. Turner & Lisney; Doulton & Co.; H. J. Baldwin & Co. Steel, iron and tools, etc.—Grey & Marten.

HAMMERSMITH.—Executive Committee. Accepted. Extension of contracts for a further twelve months. E.h.v., h.v. & l.v. cables.—Henley's. 7/.052 non-bleeding type cable.—Pirelli-General Cable Works. Insulated wire (excluding cotton and silk covered flex).—Edison Swan Electric Co. Non-ferrous metals.—Grey & Marten.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Birmingham.—Remand Home, Blackwell (£10,000); H. J. Manzoni, city engineer, Council House.

Bromsgrove.—Service garage; B. Ward, Broad Street, Sidemoor, Bromsgrove.

Caterham.—Restaurant, Caterham Hill; U.D.C. surveyor.

Chadderton.—Two wartime nurseries at Coalshaw Green Park and Brook Street (£2,401); E. Cockin, builder, 415, Foxdenton Lane, Chadderton, Oldham.

Chesterfield.—Youth Institute, Soresby Road; W. S. Wilson, borough surveyor, Town Hall.

Chingford.—British Restaurants at North Chingford and South Chingford; borough engineer.

Chislehurst and Sidcup.—Extension and improvement of fire service accommodation (£8,450); E. T. Chater, clerk, Sidcup Place, Sidcup, Kent.

Dalton-in-Furness.—Dairy, 1 Union Street; R. Long.

Darlington.—Nursery, Hundens Lane; E. Minors, borough engineer.

Glasgow.—Canteen, etc., Hillside Road, Mansewood; Burns & Laird Lines, Ltd.
Substation; Clyde Valley Electrical Power Co.

Leeds.—Erection of buildings for nurseries; W. S. Cameron, city engineer, Civic Hall.
Houses, Seacroft Estate; R. A. H. Livett, housing director, Priestley House, Quarry Hill.

Leicester.—Erection of buildings for nursery classes and alterations to four schools (£15,450); J. L. Beckett, city engineer, Town Hall.

Lowestoft.—Restaurant, Crown Street (£1,798) and shelters (£2,000); borough engineer.
Canteen, Harbour Road; Brooke Marine Motor Craft, Ltd.

Market Harborough.—Nursery, The Paddocks (£1,000); R.D.C. surveyor, Exchange Buildings.

Middlesbrough.—Alterations to Holgate Hospital for the T.C. (£2,170); borough engineer.

Middleton.—Adapting Smalley Memorial Hall for central cooking depot; J. Pollard, borough engineer, Town Hall.
Works canteen; Cromer Ring Mill (1919), Ltd.

Newcastle-on-Tyne.—Canteen, John Sinclair & Co., Ltd., tobacco manufacturers; J. W. Taylor architect, Norwich Union Buildings, Westgate Road.
Canteen at Deaf Hill Colliery; E. M. Lawson, architect, Barras Buildings, Barras Bridge.

Old Trafford.—Offices and store; Donald Macdonald, Ltd., building contractors, Stretford Road, Old Trafford. Manchester, 16.

Portsmouth.—Establishment of five nurseries; F. J. Sparks, town clerk, Royal Beach Hotel, Southsea.

Swansea.—Alterations, Nazareth House (£1,400); borough architect.
Alterations and additions, Station Road, Cockett; Milk Marketing Board.

Watford.—Crematorium; Watford Joint Burial Board.

West Sussex.—School canteens and nurseries at Crawley, Felpham and Tillington, and temporary extensions, High School for Boys; county architect, Chichester.

French Electrical News

MONSIEUR Jean Albert, the president of the Compagnie Nationale du Rhône, recently gave a talk on the Genissiat power plant which is nearing completion and which will produce 1,500 million kWh a year. He first spoke of the many difficulties the engineers had had to face since the work was first started in 1937. Owing to the peculiar bed of the Rhone which interfered with the flow, the river had first to be diverted. Underground tunnels were cut and the river was diverted through them.

He then explained that the turbines in the first four groups to be installed would have a rating of 90,000 HP, with 65,000-kW alternators. Groups 5 and 6, the installation of which is likely to be held up, will comprise 120,000-HP turbines and 85,000-kW alternators. The 15/200-kV transformers will be tied directly to the alternators by 220-kV oil-filled cables laid across the river, the transformer plant being on the right bank.

Discussing the French power position, several Vichy papers have pointed out that work on the plants under construction should be finished by 1945, when France will produce a total of 4,500 million kWh a year, an increase of 20 per cent. on the present output, while the transmission network will be increased by 4,000 km. After the signing of the Armistice in 1940 damaged plant was examined and found to be valued at about 500 million fr. Work on the Aigle, Dordogne and Genissiat plants continued and a 220-kV line from the north to Paris was started. At Monistot a new station to produce 43 million kWh per annum and another at Portelion to produce 50 million kWh were put into service. By January 1944, increased production over 1940 should equal 1,000 million kWh, and it is calculated that by 1950 France will produce 11,000 million kWh and will be in a position to export electricity.

Forthcoming Events

Institution of Electrical Engineers.—*Wireless Section.*—Wednesday, April 1st, 6 p.m. "The Technique of Frequency Measurement and its Applications to Telecommunications," by Messrs. J. E. Thwaites and F. J. M. Laver.

Meter and Instrument Section. — Friday April 10th, 6 p.m. Informal discussion on "The Post-War Integrating Meter," to be opened by Mr. E. Fawssett.

South Midland Students' Section —Thursday, April 9th, 7 p.m. Association Hall, English Electric Co., Stafford. "The Testing of Electrical Steel Alloy Sheet," by Mr. K. R. Matthews.

North-Eastern Centre.—Monday, April 13th. 7 p.m. Royal Station Hotel, Newcastle-on-Tyne. Informal conversazione with reception by the President (Sir Noel Ashbridge). Tickets 2s. 6d. each.

Royal Society of Arts.—Monday, March 30th, 1.45 p.m. John Adam Street, Adelphi, W.C.2. Last of three Cantor Lectures on "X-ray Technique in the Industrial Laboratory," by Mr. H. P. Rooksby, B.Sc.

Nottingham Society of Engineers.—Monday, March 30th. Corporation Gas Showrooms. "Measuring Methods," by Mr J. B. Sears.